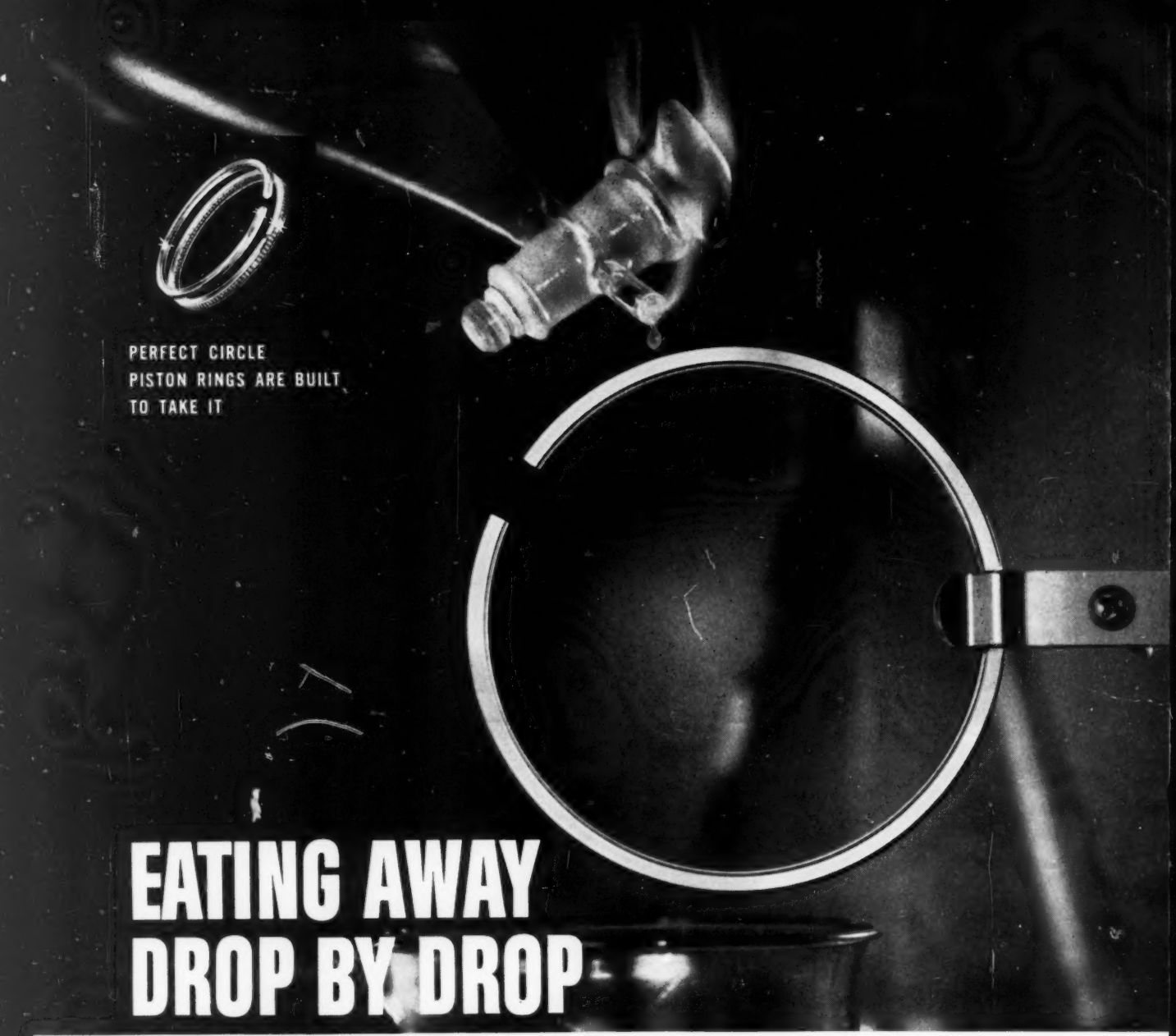
Automotive Service Digest

Our 49th year

January, 1961

Basic principles of sheet metal repair. See Page 30.



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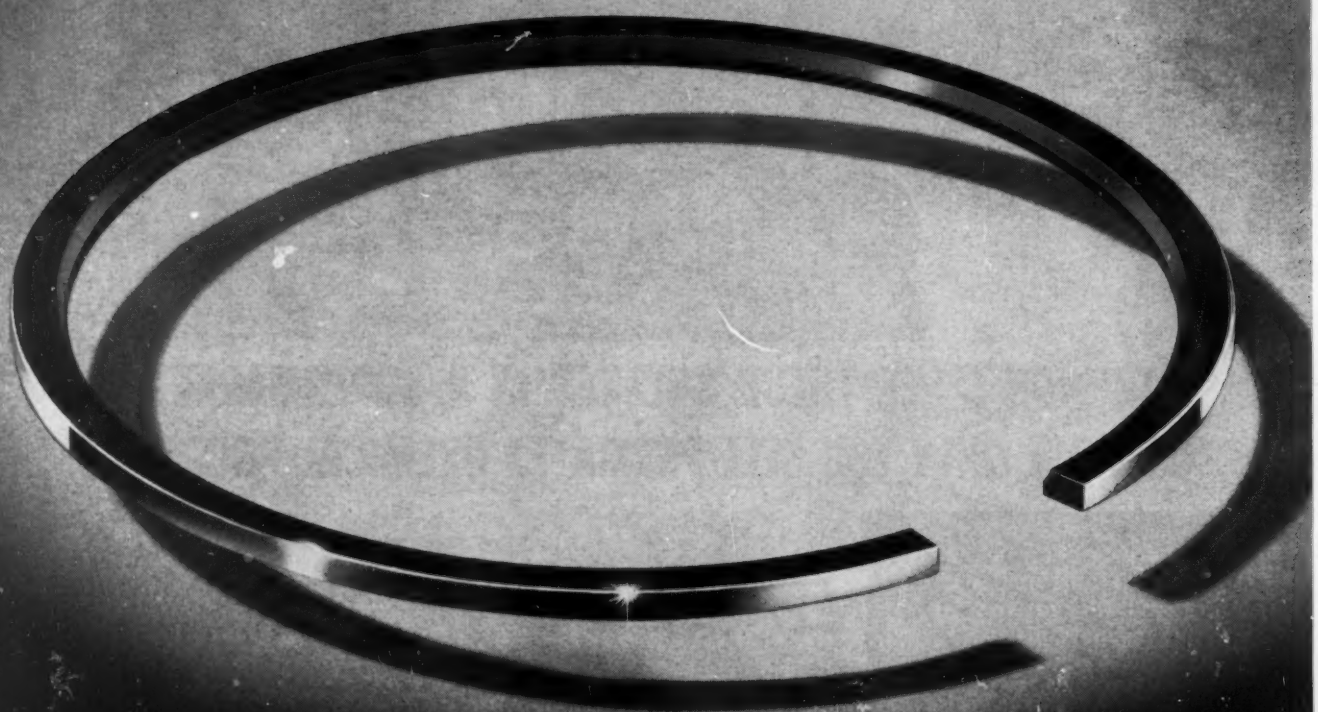

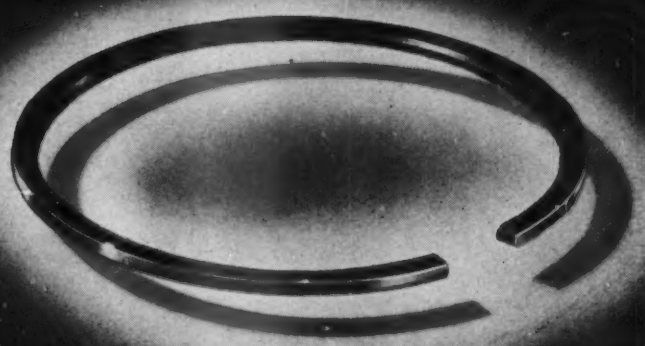

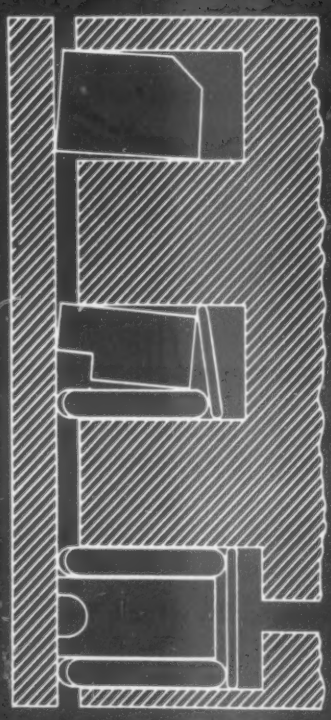

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There's a reason why so many thousands of mechanics use nothing but McQuay-Norris Leak-Proof piston rings—it's the complete customer satisfaction that comes from the new car performance and operating economy that Leak-Proof piston rings give. And there's nothing like satisfied customers to insure your consistent profits.

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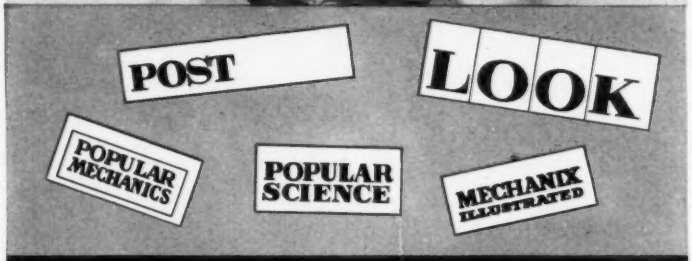

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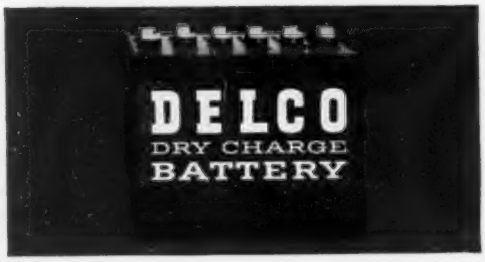

In addition to this powerful advertising support, with Delco Dry Charge you get: A complete line of batteries for car, truck, farm, marine. A huge pre-sold market . . . nearly half the cars on the road are factory-equipped with Delco. A quality product by General Motors. Merchandising and sales help to make Delco advertising pay off in sales for you. Better stock up now . . . call your Delco Battery supplier!

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VOLUME XLVIV
No. 588

January 1961

Automotive Service Digest

Cover Subject

Shown is a body repairman in the Brotzman & Biggers Chevrolet Sales service shop, Elgin, Ill., removing damaged lamp parts before undertaking the job of restoring damaged front end to original contours.

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Technical help for the service shop

Tech Know-How **articles cover how-to and what's new in approved, up-to-date shop practices, as seen and understood by men experienced in the trade.** ***Business Know-How,*** **the dollar-sign side of automotive service work;** ***Service Education,*** **the who-what-where-how of today's trade training.**

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Automotive clinic

Stuck on some problem? Need help on a job? Write us about your problem on your SHOP LETTERHEAD to insure receiving the information you are looking for. The Automotive Clinic is exclusively conducted for shop operators and others actively in the automotive service business.

Address your letter to Automotive Clinic c/o AUTOMOTIVE SERVICE DIGEST, 900 So. Wabash Ave., Chicago 5, Ill.

Ben Ikert, Editor

Troublesome Carburetor

A customer's 1957 Pontiac has been giving me a headache. About two months ago the engine would not idle, so I rebuilt the carburetor and it worked fine for three or four days . . . then it started acting up again. Acts like it is overloading, but I changed the float setting several times, but it doesn't do any good. The needle valve is holding good. Took out the metering rods, and the carburetor worked fine for two days, but then started acting up again.

Checked compression (150 lb. on all cylinders), the points are set at 30° dwell and all plugs and wires are in good shape.

When engine is cold I have to pump the accelerator about five or six times to get engine started. When I approach a stop sign on level ground at a slow rate of speed, the engine idles fine, but up or down hill it will very seldom idle. This engine is equipped with a Rochester carburetor and a Hydra-Matic transmission.

—*R.C., Muncie, Ind.*

Answer: The information given in your letter is a little confusing, as you mention removing the metering rods, which made the carburetor work fine for a few days. Carter carburetors are the only ones that use metering rods, yet you state the carburetor is a Rochester. Both the Carter AFB and the Rochester 4GC are listed for the 1957 Pontiac, so we do not know which one is on the car you worked on.

From your description of the trouble it looks to us as if partially clogged passages are the cause of the trouble. Perhaps if the carburetor is removed and thoroughly cleaned out, then reassembled and properly adjusted, the trouble will be corrected.

If you removed the metering rods from a Carter carburetor it would not work at all. The fact that you state you have to pump the accelerator five or six times to get the engine started would seem to indicate dirty passages. Also, when setting the float level, remember there are two floats to be adjusted.

Elusive Vibration

We have a customer with a 1955 Packard Patrician equipped with a levelizer. It creates a vibration around 30 mph and again around 60 mph. We have trued and balanced all the wheel and tire assemblies and have installed two new U-joints. It seems to us that if the drive line is bent it would vibrate worse the faster that the shaft revolves. It smooths out above 65 mph. The car only has 22,000 actual miles on it, but has vibrated this way for the last 10,000 miles.—*S.F., New Raymer, Colo.*

Answer: The vibration you mention apparently could come from the engine, the drive shaft, front wheels, back wheels, or rear axle. The fact that there are vibration points at 30 mph and 60 mph indicates clearly that there is something that sets up a harmonic vibration at those speeds.

If there is a dynamometer anywhere within a reasonable distance, running the car at speeds up to 60 mph would probably start up the vibration, unless it comes from the front wheels. Your next best bet would be to jack up the rear wheels securely so you can run the engine, transmission and drive line and see if you get the vibration. Possibly you can tell where the noise comes from.

You might try wiring on a ⅜" steel nut at about the middle of the drive shaft to throw it slightly out of balance. Then run the engine with the car on jacks and see if that brings in the noise and vibration. It is largely a matter of elimination of different sources of the noise and vibration that will pinpoint the actual location of the fault.

Occasional Hard Starter

I recently installed a factory rebuilt 6-cylinder Plymouth engine equipped with new fuel pump, new carburetor, new distributor—in fact, all accessories are new. Everything is adjusted according to factory specifications.

Usually, when starting with a cold engine, it kicks over in two or three revolutions, and usually, even after the engine comes up to operating temperature, it will start very easily.

Sometimes, however, it will not start until the starter turns the engine over for several hundred revolutions, and I can't figure the reason for this occasional hard starting.—*R.B., Waco, Texas.*

Answer: Since the engine starts most of the time as it should, this would indicate that operation of the ignition and fuel system is normal, except that once in a while some factor or combination of factors makes the engine hard to start.

(Continued on page 8)

Take advantage of your Automotive Service Digest clinic. Countless other shopmen do—so why not you? Your participation is welcomed.

COMPACT FOR Tight Places

RUGGED FOR Tough Jobs

Snap-on® 4-TON BODY JACK

BJ-4-S Body Jack
Yours on easy payments

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Everything is here that you need — all attachments, pads, tubes, toes, spreaders, chain, etc. — and all are made to SNAP-ON's high-quality specifications to assure long, rugged life.

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Ask about SNAP-ON wrenches in Metric or Whitworth standard sizes. Available in most popular types and sizes.

STAND KEEPS PARTS HANDY

This handsome, sturdy storage stand eliminates the chore of groping in a tool box for body jack parts and fittings. The smooth-rolling, large casters (optional) make your body jack set much more mobile and easy to transport from job to job, even over rough, uneven floors. Stand is built to withstand hard usage. Has various hooks and platforms to hold all parts of the BJ-4 set. Parts are easily and quickly removed, missing parts are spotted immediately.

YOURS ON EASY PAYMENTS

Get this 4-ton body jack now on easy terms — pay for it out of increased profits. You'll find you can do so much more, and do it so much better than with a small-capacity jack. Get all the facts from your SNAP-ON man. Or write us for new catalog describing set.

SERVICE-BACKED SHOP EQUIPMENT

SNAP-ON TOOLS

8018-A 28th Avenue • Kenosha, Wisconsin

Clinic . . . *(Continued from page 6)*

One factor could be a carburetor float valve that sticks once in a while. It might pay to remove this and examine it carefully for a burr or rough spot on either needle or guide. Also check the float to see if it could have any reason for sticking.

Next time it starts hard, check the automatic choke to see if it may be stuck. Also check the ignition voltage with a voltmeter at the coil, as it is possible that a worn ignition switch could hold the circuit open until the vibration of the engine shakes it into operating position.

Another cause might be a wire in the distributor shorting out the spark or opening the ground circuit from breaker plate to ground. And don't overlook the possibility of occasional flooding of the carburetor due to percolation.

Points Burn Out

I am having trouble keeping points, plugs, condensors, etc., in a 1960 Dodge Dart with the 318 engine and 4-barrel carburetor. These parts are burned up in about 2500 miles of driving.

I think I know the reason, but I have not been able to correct it. This unit carries an inline resistor between the battery wire and the coil but with the engine running and checking the voltage on the output side of the resistor I find that about 13 volts are leaving the resistor and going to the coil.

I have tried all kind of resistance units but I have been unable to correct this trouble. I do know that the generator circuit goes through the ignition circuit on the 1959 and 1960 Chrysler products, as I have checked out the circuits and the wiring diagrams. This same trouble also occurs on the 1960 Valiant.

Any help you can give me will be sincerely appreciated.—*F.L.S., Westfield, Ind.*

Answer: It appears that your trouble is due to too high a voltage in the ignition system, which could be caused by excessive voltage in the generating system. The voltage at the coil should be between 10 and 12 volts. The ignition ballast resistor will ordinarily hold the running voltage down to this value at the coil. The generator voltage should be between 14.4 and 14.7.

You are in error in saying that the generator circuit goes through the ignition circuit as the ignition current should not exceed 4 amperes at any time while the generator current may go as high as 30 amperes. Generator voltage will reach the ignition circuit, but the ballast resistor is designed to cut this down to 10-12 volts, as stated.

If you get the voltage regulator set to hold the generator voltage down to where it should be, the ignition voltage will be correct and there will be the usual service life on points. If you want to insert an added resistor in the ignition circuit you could use a 0.25 ohm resistor. This can be placed in series with the battery side of the coil, but not in the by-pass circuit.

Acceleration Flat Spot

Am having trouble with two Fords in my shop. They are equipped with 352 engines and four-barrel carburetors. They start fine hot or cold, but after they stand fifteen or twenty minutes while still fully warmed up, a flat spot occurs on acceleration.

The flat spot is definitely caused by no fuel in the accelerator pump chamber, which I found by checking after the fifteen minute wait. In a minute or two it will fill up and operate properly.

In one car the carburetor was changed, on the other one I replaced the intake check ball, pump diaphragm and discharge needle valve. The problem was still there.

To me it seems that the problem is evaporation or percolation of fuel out of the pump chamber.

—*J.F., Cleveland, Ohio.*

Answer: The accelerating pump on the Holley carburetor is the diaphragm type, so it is possible that the diaphragm may be ruptured or have a slight leak which would interfere with drawing in a full charge of fuel. If the pump is not working as it should, it is possible that the ball check valve and/or its weight may stick, and if the pump chamber gets empty the vent may be plugged up which would normally prevent percolation. The discharge check valve should prevent air from entering the pump chamber when the diaphragm draws fuel into the chamber.

The trouble could also be caused by a sticking pump rod or spring. Probably if the pump system is thoroughly checked the trouble can be corrected.

Elusive Knock

I would like some information on a 1959 Ford six cylinder engine.

Whenever the car is jacked up or the front of the car is higher than the back, as on a small hill, there is a knock in the engine at idle speed only. You give it a little gas and it goes away.

We could not short this noise out, so we pulled the pan to check the thrust bearing on the crankshaft but

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Eliminates towing — Saves on time and labor

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- Carries up to 14 tons.
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- New combination fold-down approach plate, bumper, and trailer hitch.

Here is the profit maker every auto salvage firm or body repair shop needs. Mounted on a conventional single or tandem axle truck, the SCHWARTZ RAMP HOIST requires just *one man* to load, transport, and unload wrecked autos because the entire job is done hydraulically. Lower the ramp in front of the damaged vehicle, attach the winch cable and the hydraulically powered winch pulls the wreck onto the ramp. The ramp is then lowered into place and you drive off at highway speeds. No hazardous towing. No need to disconnect transmissions.

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DESIGNED FOR SINGLE OR TANDEM AXLES. ALL MAKES OF TRUCKS.

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SCHWARTZ Manufacturing Co.
Lester Prairie, Minn.

the play was within limits.

We stepped on the clutch with the car jacked up and it did not make any difference. As soon as the car is let down the noise stops.

Could you help us in any way with this problem?—*E.P., Fall River, Mass.*

Answer: Apparently the noise you are worried about is a normal one due to crankshaft movement in the amount of thrust bearing clearance and is not at all a sign of engine damage or excessive wear. The fact that the noise goes away when the engine speed is above normal idle, and also when the car is on the level, shows without doubt that there is nothing wrong with the engine.

If the engine performance is satisfactory and there is no noise except under the special conditions you mentioned, we would not pay any attention to it. If your customer is one of those fussy guys who worries about things, calm him down and tell him to forget it as there is nothing wrong.

GMC Misses on No. 5

I recently re-ringed and ground the valves of a GMC 270 engine, but have a bad miss on the number five cylinder. There is a good spark up to the plugs, have 130 lb. compression, and distributor and carburetor check out okay. Why the miss?

—*F.P., Walla Walla, Wash.*

Answer: If possible, check the ignition system on an oscilloscope, which will tell you whether the trouble is electrical. Then, if possible, make a test with a cylinder leakage tester to see if there is any unusual leakage in valves, rings or head gasket. Check for any air leaks around the carburetor or intake manifold. Examine the distributor to see if there could possibly be a chance for the No. 5 spark to jump to ground, or through a crack in the distributor cap.

To make your shop more profitable . . . your time more valuable . . . be sure to read this month's "These Are New" section

Also check to see if the No. 5 distributor cam is worn so that the points do not open as they should for this cylinder. Check over the wiring in the high tension circuit to see if there is any cross firing. If No. 5 wire is parallel to another wire, re-position it so it is at an angle. Be sure that No. 5 wire has continuity, with no hidden gaps at one of the terminals. Check the tower in the distributor to see that there is no corrosion that would cause high resistance. Also check polarity at the HT system to see it is negative at the spark plugs.

All In the Imagination?

After reading several letters and articles on "hard-to-start-when-hot" I submit the following, knowing my statement will not be accepted by the car manufacturers.

However, here's what I do. When temperature is about 32°F., I reverse the spring on the heat riser valve; when temperature is under 32°F., I install it as it should be.

I have a customer who brings me his late-model Ford (352 cu. in. engine, w/4-barrel carburetor) complaining about hard starting when engine is hot. I reverse the spring on the heat riser valve, and he stays happy. Of course, I do the same on my own car, and I find the engine starts on 1½ revolutions.

In my opinion, the spring in question has too much tension, so the valve never opens as it should.

—*G.M., Oklahoma City, Okla.*

Answer: We are at a loss to see what is accomplished by reversing the heat riser spring. This will not have any affect on starting of the engine, as when the engine is first started, everything is cold, including the intake manifold . . . and no parts get warm until the engine has run for a while. The heat riser is only of value after the engine has started and from that time until it is warmed up enough to open the heat riser valve.

It seems to us that your customer who comes back to have his heat riser spring reversed has a good imagination and thinks that reversing the spring helps because in warmer weather his car starts OK.

Brass Hub Caps—Handle With Care

Many new Buick Special compacts are equipped with brass hub caps. Since such hub caps will dent far more easily than other types, the factory is urging caution when installing them.

The hub caps should be fitted with the heel of the hand or with very light tapping with a rubber mallet. Only a small amount of effort is required to snap them in place.

Battery Care With Alternator Systems

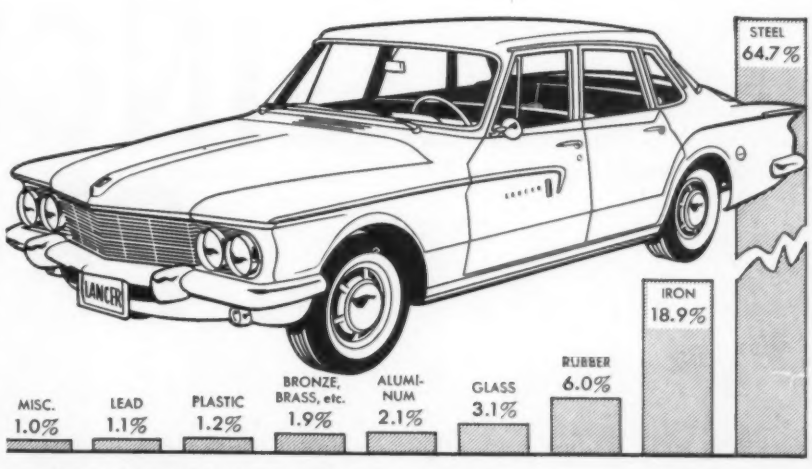
It is extremely important to inform all service personnel who have the occasion to install a battery, use a battery charger, or a booster battery, of the necessary caution that must be exercised when performing these operations on alternator-equipped cars.

Battery Polarity: Always connect the negative (—) battery post to ground. Incorrect battery polarity may damage the wiring harness, alternator windings or rectifiers.

Fast Charger: In all cases where a "fast charge" battery charger is used without removing the battery, *both car battery cables must be disconnected* from the battery, before the "fast charger" is connected to the battery. *Do not use a "fast charger" to provide starting voltage.*

Booster Battery: If it becomes necessary to use a booster battery to start the car, be sure to connect the "negative cable" of the booster battery to the "negative" (ground) terminal of the car battery, and the "positive cable" of the booster battery to the "positive" terminal of the car battery.

What is a car made of?



Steel is still the major material in the modern car, accounting for almost two-thirds of the weight. The percentages of other materials used in this typical compact, a Dodge Lancer, are shown in the drawing above.

SPECIFY

DELCO-REMY IGNITION PARTS TO RESTORE NEW-CAR PERFORMANCE, *SPEED SERVICE,* INCREASE PROFITS!

Here's opportunity for you! A national trade magazine* survey shows that 84% of the cars on the road today need some kind of ignition work. Just take a quick look under the distributor caps of your customers' cars, and when you spot trouble, suggest a complete tune-up—replace worn ignition components with Delco-Remy parts.

Why Delco-Remy? Because they are the *quality* ignition service parts for all popular American cars and light trucks. They're ready to install, and make ignition systems perform like new. And new packages make these Delco-Remy parts easier to stock, identify and sell.

1 DELCO-REMY DISTRIBUTOR CAPS are designed and built of highly dielectric, shock and heat resistant materials, and feature voltage-saving internal ribs.

2 DELCO-REMY CONTACT SETS are factory-adjusted and aligned for quick, easy installation. Heat-sealed, moisture-proof packages protect contact sets against dirt and oxidation.

3 DELCO-REMY ROTORS combine maximum strength with minimum weight and superior balance to assure smooth rotation at slow or turnpike speeds.

4 DELCO-REMY CONDENSERS assure correct electrical capacity and resist voltage breakdown. Hermetic seal keeps out harmful moisture, oil, and vapors.

Delco-Remy electrical parts are available at car or truck dealers, or through the United Motors System.

*MOTOR—June, 1959

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electrical systems

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Hastings Piston Rings are

GENTLE

on cylinder walls

● Hastings Oil Rings have "wide open" spacers—the most ventilated in the entire industry—therefore deliver more oil to the cylinder walls. The narrow contacts of the steel rails assure positive oil control. Result: adequate lubrication, less wear, longer life for cylinder walls, pistons and rings.

Moreover, the Hastings "shell molding" process of making piston ring iron—a brand new, *different* process—gives you compression rings with more free graphite . . . and graphite is a metallic lubricant. It lubricates the cylinders and provides extra lubrication at the top, where the heat is greatest, and there's the least amount of oil.

This extra protection and longer life for cylinder walls and pistons is coupled with Hastings' established reputation for controlling oil—*completely*. Hastings means no more come-backs . . . better profit . . . and satisfied customers from the start.

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Hastings Ltd., Toronto
Piston Rings, Oil Filters, Casite Additives, Spark Plugs

STEEL-VENT OIL

FLEX-VENT OIL

In these typical Hastings oil rings, you can see for yourself the ample ventilation that provides efficient drain-back . . . prevents clogging . . . gives lasting oil control.

HASTINGS PISTON RINGS

Hastings Fire-Power Spark Plugs . . . engineered for replacement service . . . give premium performance, at competitive prices, with better profit for you.

Editor's page

A well directed plan to get mechanics

• "THOSE IN THE BUSINESS of making, selling, servicing and operating automobiles and trucks, can solve a pressing problem and benefit car owners by playing big brother to U.S. male youth." So said Erwin R. Stroh, Autolite vice-president, at the annual meeting of the Automotive Electrical Association convention, recently held in Chicago.

His talk was a challenge to all concerned toward helping lick the serious dearth of trained mechanics. He called for deserved recognition of the automotive mechanics field as a highly regarded, well paying and necessary specialty, the true status of which has too long been obscured.

In launching his "Project Mechanics" he seeks the aid of every organization and association involved in the automotive business. At the moment there are several separate committees worrying about the problem—few, however, are working together. A complete program must be organized, every channel of communication and influence hit to stimulate interest in automotive mechanics as the fine career it represents for young men.

By giving the field of automotive mechanics the recognition it deserves, interest will be restored in this vital function among young men with lesser formal schooling. It's something to think about, and as Mr. Stroh pointed out:

"Opening up this employment vista for the vast reservoir of non-college men and non-high school graduates, would relieve growing pressures on college capacity."

Many young fellows contemplating going to college might be a lot better off financially and otherwise, by getting into the automotive service field. With the complexity of modern vehicles, adequately trained service men are, as a matter of fact, very near the level of engineers.

Full credit is due Autolite for a timely plan directed toward giving the mechanic program cohesion and the vocation itself stature long overdue in our business-social structure.

Ben Ikert
EDITOR

Progress of the gas turbine engine

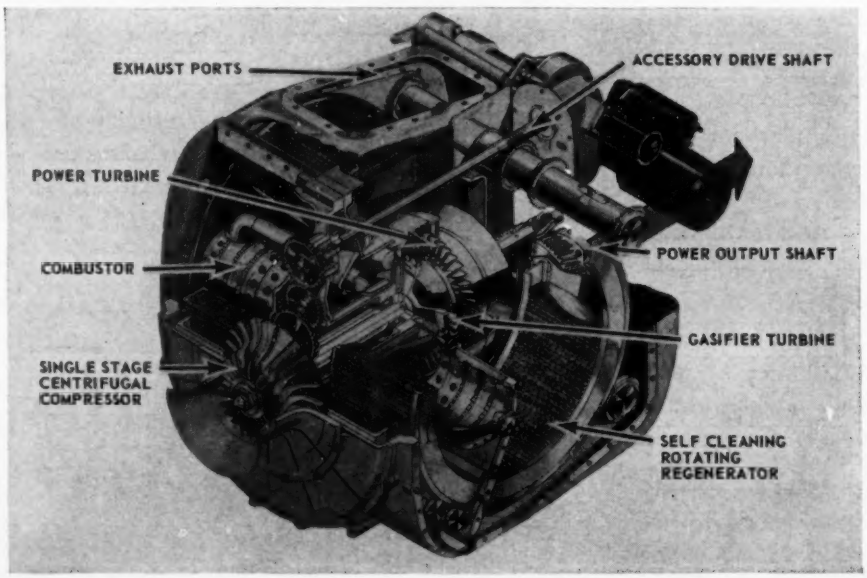
Recent break-throughs have brought the gas turbine engine ever closer as a means of powering automotive trucks and passenger cars. Although it will be some time before they will be entering your service shop, it will pay you to study this article and become acquainted with operating principles involved.

• DEVELOPMENT OF THE gas turbine engine is coming so rapidly and showing such promise that many engineers close to these projects are definitely predicting that the day of its final arrival into practical use is not far away. Just to illustrate how far along the gas turbine has come, all of the so-called "Big Three" have actual engines running and performing in many ways superior to any piston engine ever developed, and in fact, in some ways beyond the possibilities of this type engine.

Active in the development of these engines is the Allison Division of General Motors, with its Whirlfire gas turbine; Ford with its Model "704" and Chrysler Corp. with its own design. The development of the gas turbine is by no means confined to America. The British Rover Company, for example, has had a power unit of this type under active development since 1942, and early in 1951 the Royal Automobile Club awarded the Dewar trophy for "the most outstanding technical achievement in automobile engineering during a given year," to the Rover Company for producing a gas turbine car.

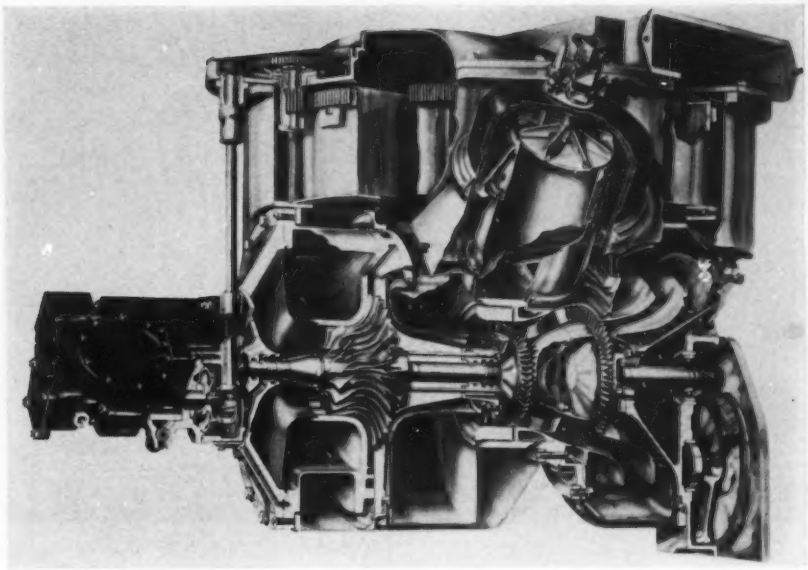
Early in 1959, the Engineering Development Department of General Motors Research Laboratories demonstrated its experimental car, the Firebird III, equipped with the GT-305 regenerative gas turbine engine which showed a marked advance both in horsepower per pound of fuel and horsepower per pound of engine weight over the previous gas turbines under development by this laboratory. Currently at General Motors, the Allison Division in Indianapolis now has the GMT 305 gas turbine engine which develops 225 hp. with marked advantages in compactness, light weight and economy.

Right now, Ford has its prototype 704 gas turbine engine installed in a heavy-duty truck just about to start on a series of exhaustive tests, both over the road and on the Ford proving grounds. Similarly,



The Allison GMT-305 "Whirlfire" 225 hp. gas turbine engine.

By J. EDWARD SCHIPPER
Detroit Editor



Cut-away view of Chrysler Corp.'s experimental gas turbine engine.

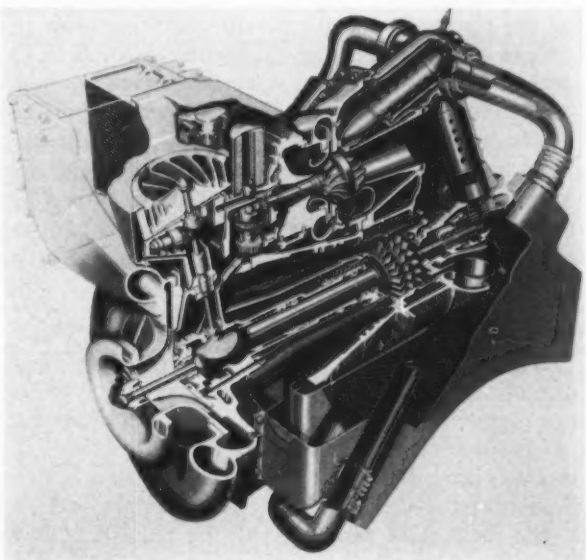
Chrysler Corp. has had in operation its lightweight gas turbine which is suitable for installation in a standard automobile. This particular engine develops 140 hp. and weighs only 450 lbs. as compared with 600 lbs. in a reciprocating engine of the same horsepower. It has two features which have always been hard to achieve in the turbine type engine. First, rapid acceleration from a dead stop and good fuel economy as compared with reciprocating engines of the same horsepower. The matter of acceleration from a standing stop and fuel economy have been until recently definite road blocks in the development of the turbine.

FUEL CONSUMPTION YARDSTICK

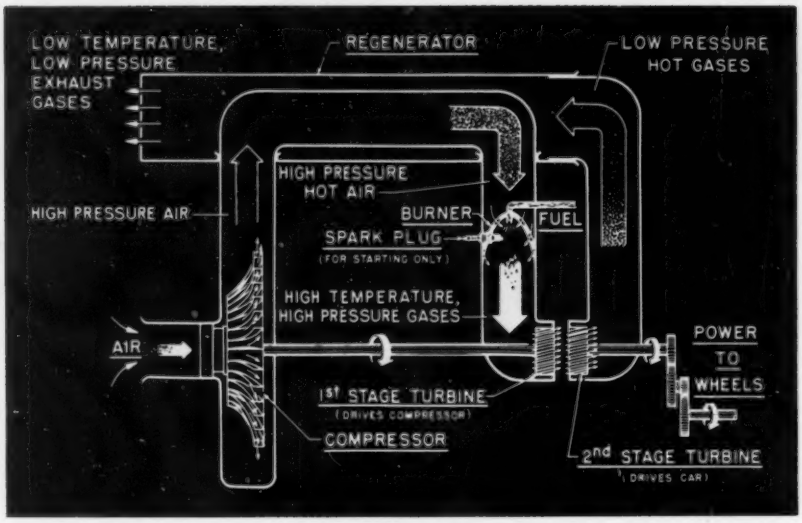
The reciprocating engine in general use has for many years had a yardstick, as far as fuel consumption is concerned, of ½ lb. of fuel per brake-horsepower-hour. The Allison GMT 305 gas turbine engine has shown .55 lb. per brake horsepower hour in the prototype and has an expectancy of .45 lb. per brake horsepower hour in the production engine. This not only measures up to the best fuel economy for the reciprocating engine but also does not take into consideration the fact that the GMT-305 operates on kerosene, JP, Diesel No. 1, Diesel No. 2, or unleaded gasoline without purging between fuels. It can also be adapted to operate on liquid petroleum gas, natural gas, sewer gas or similar gaseous fuels.

With all of these advantages, it can readily be seen that there has been a major break-through all along the line on gas turbines and we have come to the point where probably first in trucks, and then later in passenger cars, we can expect to see them in growing general use. A great deal will be learned about the immediate future of these engines very shortly as a major paper on this subject is being presented at the SAE national meeting being held in Detroit as this issue goes to press. This paper, with the accompanying discussions will establish a platform from which developments for the immediate future can be predicted.

Reviewing the development of the turbine idea from its beginning, Chrysler's Engineering Depart-



Cut-away view of the Ford Motor Co.'s "704" supercharged automotive gas turbine showing the low pressure compressor and turbine drive assembly (lower center); intercooler fan (upper left foreground); intercooler (extreme upper left); high pressure compressor, turbine and accessory drive (upper center); primary and secondary combustion chambers (upper right); exhaust heat exchanger (lower right); and power output turbine (right center).



Schematic diagram of Chrysler's experimental gas turbine engine shows how the regenerator unit (top) transfers heat from the exhaust gas to incoming fresh air on its way to combustion chamber. The regenerator performs two important jobs: (1) greatly reduces exhaust gas temperature, and (2) utilizes previously wasted fuel energy (heat).

ment points out that the earliest type of heat engine is almost 2,000 years old and goes back to Hero of Alexandria. He made a crude steam turbine that was little more than a toy, but in doing so he suggested ways of putting it to practical use. The windmill and the water wheel are both turbines and they have been used by man for thousands of years to irrigate his fields and to grind his grain.

The beginning of the present type of reciprocating internal combustion engine in regular use occurred about 85 years ago when Dr. Nicholas Otto, realizing that engines were simply a device for converting heat energy into mechanical energy, eliminated the steam boiler and built the fire right in the engine cylinder. In spite of the fact that this was, and is, a most inefficient use of heat, with a maximum theoretical use of only about 28 per cent thermal efficiency, the Otto cycle engine has been refined and developed into a marvel of performance.

Practically all power delivered to the rear wheels of the car under usual operation averages less than 15 per cent of the energy contained in the fuel. One reason for this great loss is the fact that the reciprocating engine attains its highest thermal efficiency under peak load conditions which are seldom, if ever, reached in the operation of passenger automobiles. As compared with this, the theoretical thermal efficiency of the regenerative turbine engine is estimated at 40 per cent throughout the working range of the power plant.

HOW TURBINE OPERATES

It may be interesting at this point, to review the operation of the gas turbine. Like the piston engine, the turbine is an internal combustion unit, but the gas turbine is all-rotary, whereas the piston engine requires periodic explosions in the cylinders to move the pistons which in turn deliver rotational energy to the crankshaft. However, all the requirements for the internal combustion engine are present in both. The four necessary phases are air induction, air compression, air heating and air expansion.

How these processes are carried on in a piston engine is familiar to all of us. The gas turbine employs compression, heating and expansion also, but it differs fundamentally in this way: It does not gulp air and fuel as each cylinder of a reciprocating engine does. Instead, it takes in air at a steady stream. Instead of a sequence of steps occurring in one cylinder the process is continuous, occurring in stages throughout the components of the gas turbine engine.

HEAT ADDED TO FUEL CONTINUOUSLY

In a typical cycle, air is drawn into a compressor. Here pressure is raised and the air passes to a burner where it meets the entering fuel. After being heated by the burning fuel, the jet stream of gases expands through the first turbine wheel, which produces enough power to drive the compressor. Then, the hot expanding gases continue on through the second turbine which generates the useful power. In the piston engine, heat is added to the gas at a **constant volume** (that is, all at once, when the piston is near the top of the cylinder) whereas in the gas turbine, heat is added to the gas at a **constant pressure** or continuously.

This operating cycle is illustrated as applied to the Chrysler turbine in the schematic diagram. The air compressor sucks in air and "squeezes" it to raise the pressure to several times atmospheric pressure. In the process of compression, the air also rises in temperature. The high pressure air flows to the combustion chamber where fuel sprays continuously and burns, heating the air to about 1600° F. This very hot stream of compressed gas forces its way through the blades of the first turbine which rotates the air compressor, and then goes through the blades of the second turbine which is connected to the rear wheels to drive the car. At idle, the speed of the compressor

turbine is near 20,000 rpm while that of the car-driving turbine is near zero (a situation comparable to the turbine of a torque converter). The car-driving turbine can rotate at speeds upwards of 45,000 rpm. Of course, this rotation must be geared down in the engine to a useable speed for driving the wheels of the car.

From the burner through the turbines, there is a drop in pressure of the gases to atmospheric pressure, but they retain large amounts of heat which would be wasted if merely allowed to escape through the exhaust pipe. So a device for salvaging this heat is placed in the path of the out-rushing gases. This component is a regenerator, a form of heat exchanger. It recovers heat from the hot exhaust gases and transfers this energy to the high pressure air coming from the compressor. This lightens the burner's job of raising the gas temperature for entry to the turbines. The result is conservation of fuel as well as lower exhaust temperatures.

The gas turbine's electrical system consists of a storage battery, starter-generator, coil, breaker, and a single spark plug. To start the car you turn the key as you do in your present car. This starts the starter motor which turns the compressor. When the compressor speed increases part way to the idle speed of 18,000 rpm, the fuel (ignited initially only by the spark plug) will continue to burn and help the starter motor bring the compressor up to operating speed. At this point, the circuit switches and the starter motor serves as a generator to charge the battery.

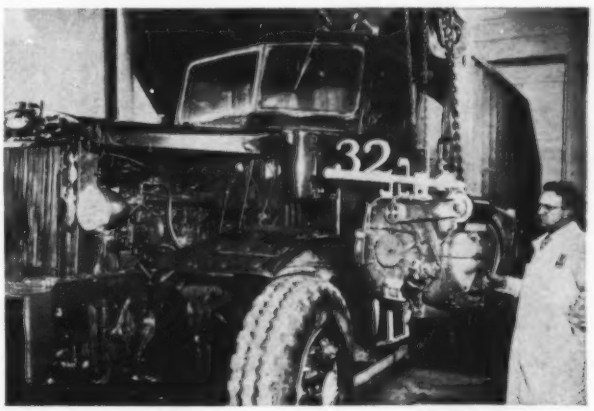
TURBINE A BUILT-IN TORQUE CONVERTER

The torque characteristic of the turbine should be noted since it is one of the outstanding advantages of this type of engine. In a car, the turbine's torque is greatest at break-away from a standing position and falls off as the car speed increases, where it is least necessary. This contrasts sharply with the piston engine's torque characteristic, which gradually builds from zero at the start to a maximum in the mid-speed range. The car-driving turbine is, in effect, a built-in torque converter and is connected directly through gear trains to the rear wheels of the car. Chrysler Corporation's experimental turbine-driven automobiles use a modified TorqueFlite transmission as a convenient means of conveying power from the reduction gear to the propeller shaft, and to provide for reverse.

The Ford 704 gas turbine differs from others in that instead of having one stage of air compression, the Ford has two; one a super-charging stage which is claimed to make the engine deliver more horsepower from a smaller size unit. Instead of having only one combustion chamber, the 704 has dual burners. On this engine the maximum fuel economy is attained in a range of from 25 to 100 per cent of full power. This overcomes one of the early difficulties with turbines when they were, like piston engines, most efficient only when operating at full power.

Many of the parts of a turbine operate at extremely high speeds. For example, on the Ford 704, air is drawn into the first or low-speed compressor which operates at 46,500 rpm. Assuming an ambient air temperature of 100° F., the 4:1 compression ratio raises air temperature to approximately 450°. At full engine power air flow is 2.7 pounds per second.

The air next passes through an inter-cooler where its temperature is reduced to about 220°. The inter-cooler employs a centrifugal type of blower driven at 19,000 rpm through a step-down gear from the shaft of the low-speed compressor. After cooling, the air passes to the high-speed compressor and through another 4:1 compression stage which raises the temperature again; this time to about 625° F. The high-speed compressor spool operates at 91,500 rpm. Another 375° temperature rise is attained as the air passes through the exhaust heat exchanger and enters the combustion chamber at roughly 1,000° F.



A big advantage of the turbine engine is its compactness. Generally a turbine engine will take up much less space than the conventional engine it replaces.

Fuel is added and the mixture burns in the primary combustion chamber. At 1700° the exhaust gases drive the high-speed turbine that turns the high compressor spool. This supplies power to the turbine wheel and reduces the temperature to about 1350°.

Additional fuel is added in the secondary combustion chamber to bring the temperature back up to the 1700°. From here the exhaust gases pass through the power turbine, driving it at a speed of 36,000 rpm, and through two turbine wheels that drive the low speed compressor.

Next the exhaust gases move to the heat exchanger where they release heat to the incoming air after the second compression stage. They are re-

(Continued on page 37)

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Controlling generator output

Prime purpose of the "voltage regulator" is to keep a normal battery-operated automotive electrical system in balance. Installing new regulators rarely compensates for a malfunctioning battery, generator or other unit in the system.

By GUY F. WETZEL
Technical Editor

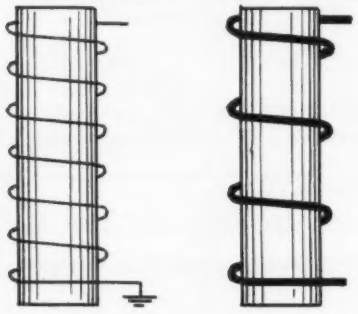
• WITH THE EXCEPTION OF the 1961 Chrysler line cars equipped with alternators, the three-unit generator control (more popularly called the "voltage regulator") is a vitally important and widely used equipment item of automobile electrical current generating systems.

Yet, in spite of its wide use, the three-unit generator control is probably one of the least understood units of the conventional type electrical system.

The generator controls or "regulators," unnecessarily replaced every year due to this lack of understanding is staggering and an imposition on motor vehicle owners. You as a mechanic may say, "I can make more money by replacing a regulator than by adjusting or servicing it." This statement should not be true, because if you properly adjust a regulator and carefully clean the contact points, you can legitimately charge as much as your profit from installing a replacement. At the same time you are saving the motorist the price of the replacement unit. Whenever you can save a customer money without sacrificing on your part, you will be smart to do so. Especially since there is more or less a rebellion going on right now against high repair charges. This hurts the service business.

It is felt that if the generator control is discussed step by step, in logical order, that it will be easy for the reader to get the idea of its operation and adjustment so it can be serviced with confidence and precision.

Figs. 1 & 2. Voltage coil (left) consisting of a coil of many turns of fine wire on a soft iron core, connected in parallel or shunt, with a current source, with one end grounded. Magnetic effect is proportional to its voltage. Current coil (right), consisting of a few turns of heavy wire on a soft iron core, connected in series with a current source, so full current flows through coil. Magnetic effect is proportional to current flowing.

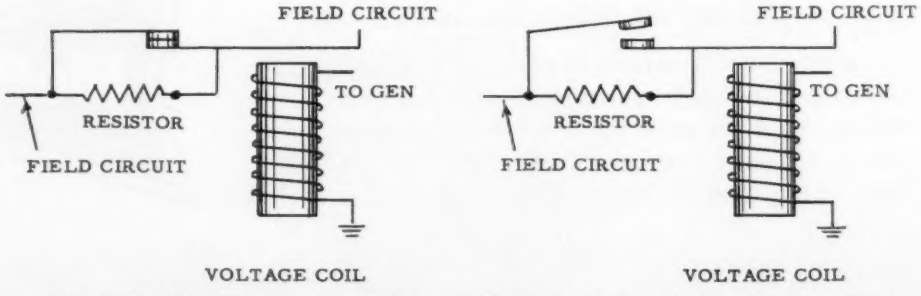


VOLTAGE COIL CURRENT COIL

VOLTAGE COIL AND CURRENT COIL

The first thing to do is to become acquainted with (1) the voltage coil and (2) the current coil. These are sometimes referred to as the shunt coil and the series coil, respectively.

The reader will recall that when a coil of wire is wound on an iron core and electric current is passed through the coil, the iron core becomes magnetized. The magnetism will exist as long as the current flows through the coil. The strength of the magnetism is



Figs. 3 & 4. The two current paths for the field current in the voltage limiter; low resistance path with points closed is shown at left; at right, high resistance path with points open.

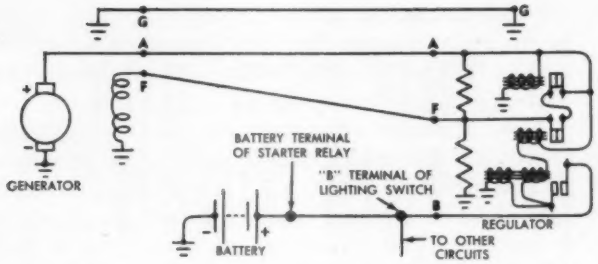


Fig. 5. Showing the relationship of the three regulator units and how the contact points of the voltage and current limiters are in series. This shows the B circuit with field current coming from regulator and grounded in generator.

proportional to both the number of turns of wire in the coil and the number of amperes flowing through the coil. A composite unit has been devised to measure the strength of the magnetism-inducing current, namely, "ampere-turns," the value of which is obtained by multiplying together the number of turns of wire in the coil and the number of amperes flowing.

Thus, 1,000 turns of fairly fine wire with 1 amp. flowing would have 1,000 ampere-turns, while if there were only 50 turns with 20 amps. flowing, there would still be 1,000 ampere turns. In both coils the magnetic effect would be the same.

VOLTAGE COIL (OR SHUNT COIL)

Consider a coil of fine wire with a large number of turns wound on a soft iron core, and so designed that the voltage drop across the coil is equivalent to the voltage of the circuit in which it is to be placed. Now, with one end of the coil connected to the generator output circuit and the other end of the coil grounded, you have an electro-magnet when the generator is producing current. The strength of this magnet will be proportional to the voltage of the current coming from the generator, because the strength of the tiny current that flows in the coil is proportional to the voltage of the current source. Such a coil is called a "voltage coil" or "shunt coil" (Fig. 1), and is always in parallel or shunt, with the current source; or it can be said to be across the current source, which in this case is the generator.

Now if this voltage coil is so arranged that it can affect a hinged and spring-balanced iron lever, or armature, movement of this lever will vary with any appreciable variations in the generator voltage.

VOLTAGE REGULATOR

This principle is utilized to control the voltage of the D.C. generator output. While reference is made to the voltage of the automobile generator as "6 volts" or "12 volts," actually this voltage varies from battery voltage, or slightly above, to the maximum controlled voltage. This would be approximately 6.2 to 7.4 volts or 12.4 to 15 volts, respectively for 6- and 12-volt systems. So you see the generator voltage has considerable leeway and will depend on two definite factors: (1) battery state of charge, and (2) connected electrical load on the generator.

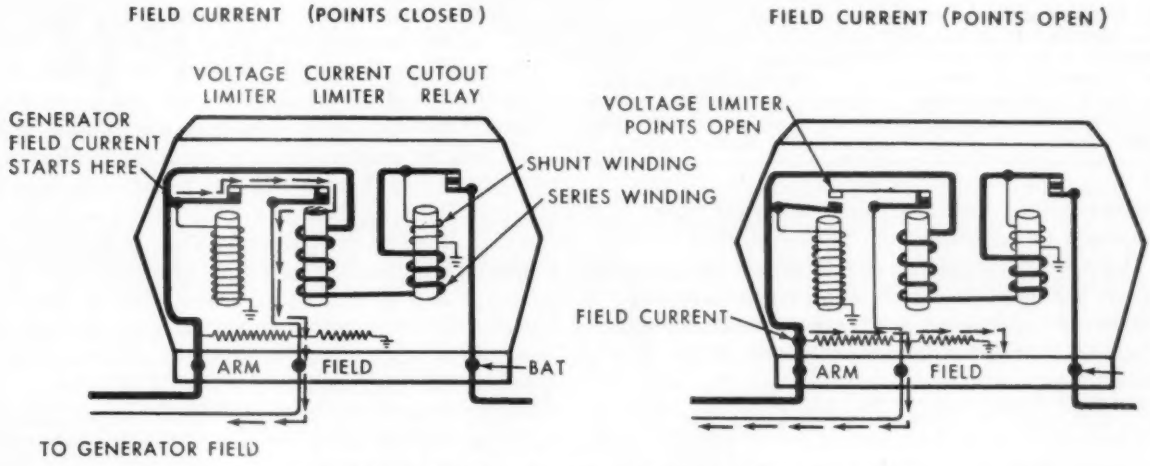


Fig. 6. Illustrating the two current paths for the field current. The dotted lines show current flow with points closed and open.

When the generator is being driven too slowly to put out current, the electric system will be at battery voltage. When the generator is producing current, its voltage will vary from slightly above battery voltage to the maximum controlled voltage, depending on the amount of battery counter voltage. This, in turn, depends on how well the battery is charged, and how many current using appliances or devices are turned on.

The voltage of the generated current can be readily controlled by controlling the strength of the generator field current. If there were no control on the two-brush shunt generator, the voltage would be approximately proportional to the generator speed and the number of amperes produced would depend on the electrical load; in other words, on the number

and size of the current paths for the generator output to follow to ground, including the battery. As the uncontrolled generator speed increases with increasing engine speed, the high voltage forces more current through the generator windings than they can carry and the generator will quickly burn out. The high voltage, if there were time enough, would also cause excessive current to flow across the distributor

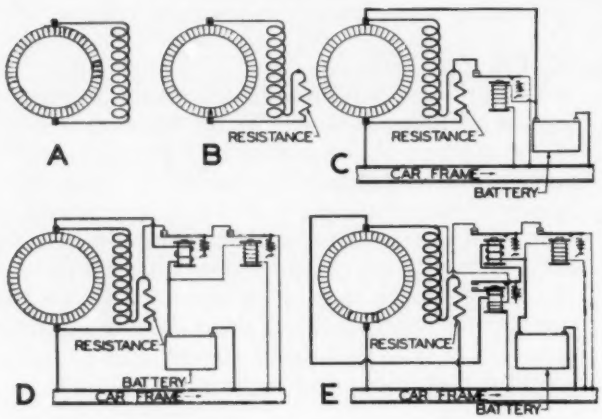


Fig. 7. Shunt generator and regulator, showing development of the regulator. At A, there is no generator control. At B, a resistance is introduced which will cut down generator output. At C, resistance is controlled by a vibrating voltage regulator. At D, a current limiter is added to limit the amperes the generator is allowed to put out. At E, a cut-out relay is added which completes the three unit generator control.

breaker points, and any other electrical items that happened to be turned on, with resultant damage.

The voltage regulator is connected as shown in Fig. 3. The generator field current flows through a soft iron flexibly hinged lever (or armature) which is part of the field circuit. The lever is fitted with a contact point which connects electrically with another fixed contact point. The points are held in contact with each other by a spring which applies pressure to the hinged armature.

Referring to Fig. 3, notice that there are two current paths for the field current to follow. One of these paths is through an ample size, low-resistance conductor while the other path is through a resistor with fairly high resistance, which may be either of the wire-wound or carbon-link type. As long as the points are in contact the field current will take the path of least resistance and flow without interference to the generator field windings.

Now consider what happens as the generator speeds up above idle engine speed. The generator voltage will start to increase, which causes the voltage across the voltage coil of the voltage regulator to increase. This will cause more current to flow through the coil and its magnetic effect will increase in strength. When this strength becomes great enough it will overcome the pull of the regulator spring on the regulator armature and the armature will be pulled down toward the magnet, causing the contact points to separate (Fig. 4). With points separated the easy current path is broken and the current is forced to take the more difficult path through the resistor. The resistance of the resistor is so designed that when introduced into the field circuit it will weaken the field current enough to hold the generator voltage down to a predetermined value.

ACTUALLY LIMITS GENERATOR VOLTAGE

Actually the voltage regulator is a voltage "limiter," as its function is to limit generator voltage to the maximum value for which it is adjusted. As the generator voltage increases it will get up to a point where the magnetic effect on the limiter voltage coil will be great enough to cause the contact points to separate and introduce the resistor into the field circuit. This weakens the field circuit and the generator voltage is reduced. The reduced voltage causes less current to flow through the limiter voltage coil so that its magnetic effect is weakened. When the reduced magnetic pull on the armature reaches a point where it is less than the pull of the spring on the armature, the points again make contact to re-establish the "easy" field current path.

With the points in contact and the resistor out of the field current path, the field current becomes stronger, which makes the generator voltage higher. When it gets high enough the limiter voltage coil again gets strong enough to open the contact points and start another control cycle. This series of events repeats itself with considerable rapidity so that the

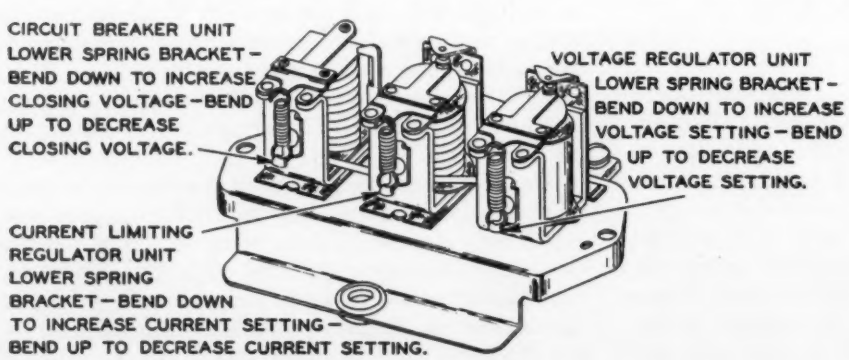

CIRCUIT BREAKER UNIT LOWER SPRING BRACKET – BEND DOWN TO INCREASE CLOSING VOLTAGE – BEND UP TO DECREASE CLOSING VOLTAGE.
CURRENT LIMITING REGULATOR UNIT LOWER SPRING BRACKET – BEND DOWN TO INCREASE CURRENT SETTING – BEND UP TO DECREASE CURRENT SETTING.
VOLTAGE REGULATOR UNIT LOWER SPRING BRACKET – BEND DOWN TO INCREASE VOLTAGE SETTING – BEND UP TO DECREASE VOLTAGE SETTING.

Fig. 8. Three unit generator control, showing the springs that balance the armatures and the spring hangers that may be bent to adjust spring tension.

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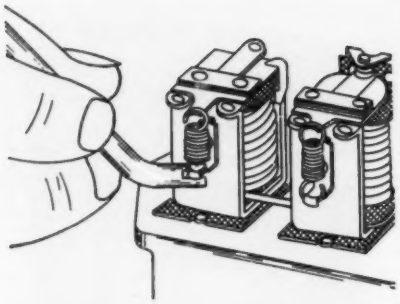


Fig. 9. How the spring hanger is bent with a simple tool, which can be easily made. Bending must be done just a little at a time as this is a sensitive adjustment.

movable point actually vibrates at high speed (50 to 200 times per second). The higher the generator voltage tries to get, the higher the rate of contact point vibration, to hold the generator voltage down to the desired value. The more rapid the vibration, the less time for the contact points to remain closed.

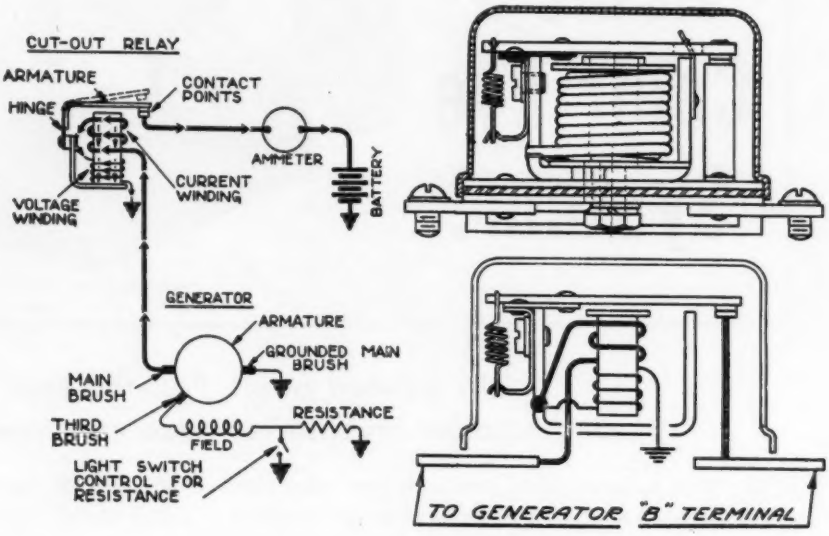


Fig. 10. The cut-out relay, showing its connection in the generating system and its construction.

And, with the resistor in the circuit more of the time, the field current is reduced.

The strength of the magnetic effect of the voltage coil required to overcome the limiter spring tension depends on the pull of the spring. This pull is adjustable. Spring tension is adjusted by slightly changing its length, which is done either by bending the lower spring hanger (Fig. 9), or turning an adjusting screw which changes the spring tension. The higher the tension the greater is the force required to overcome it and the higher will be the controlled voltage. Conversely, lowering the spring tension lowers the limiter controlled voltage.

The spring tension adjustment is sensitive. A slight change in the spring length, which affects its tension, has an important effect on the generator voltage.

ADJUSTING THE VOLTAGE LIMITER

The adjustment is simple. It is first necessary to properly connect a suitable voltmeter (which will be discussed later) to measure the voltage of the generator output. With the voltmeter connected and positioned where it can be seen readily, run the engine long enough for it, the generator, and the regulator to get up to normal running temperature. If the voltage is not as specified, adjustment will be necessary. Remove the regulator cover. Notice the difference in voltage with the cover in place and then removed. If the voltage is too high, bend the spring hanger UP just a little, and note the voltage. If the voltage is too low, bend the hanger DOWN a little bit to increase the spring tension. Make the needed adjustment to get the voltage to the specified value, allowing for the difference between cover off and on. When the voltage is at the desired point, replace the cover and the job is done. Be sure to check it with the cover back in place; if not correct, try it again.

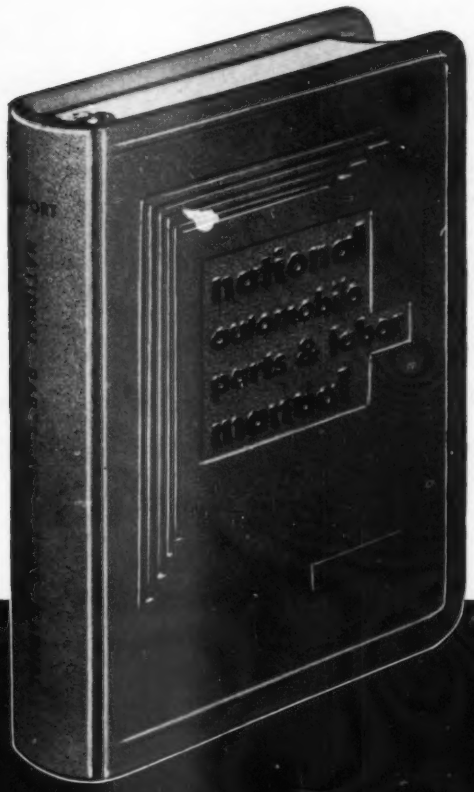
CONNECTING THE VOLTMETER

Connect the positive voltmeter lead to the A or G terminal on the regulator and the other lead to ground (on negative ground systems). Reverse for positive ground systems. If the battery is charged to 1.250, or higher, gravity, it is only necessary to run the engine (after warming it up) long enough so the voltage reading is stabilized. The reading of the meter will be the voltage setting. Accelerate the engine a few times for 15 or 20 seconds at a time to see if the voltage changes.

If the battery is below 1.250 gravity it is advisable to insert 1/4-ohm resistor in series with the B regulator terminal to compensate for the lower battery state of charge which lowers the battery counter voltage. The 1/4-ohm resistor may be a separate resistor unit or built-in with the voltmeter or volt-amps tester, as some makers of equipment do.

When taking the voltage reading, the generator should be cycled by allowing the engine to drop to

(Continued on page 59)



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Changes in "lube" practice for '61

Radical changes in chassis lubrication recommendations and oil change intervals for most 1961 cars finds the American Petroleum Institute and some of the car manufacturers face to face with a difference of opinions.

By J. EDWARD SCHIPPER
Detroit Editor

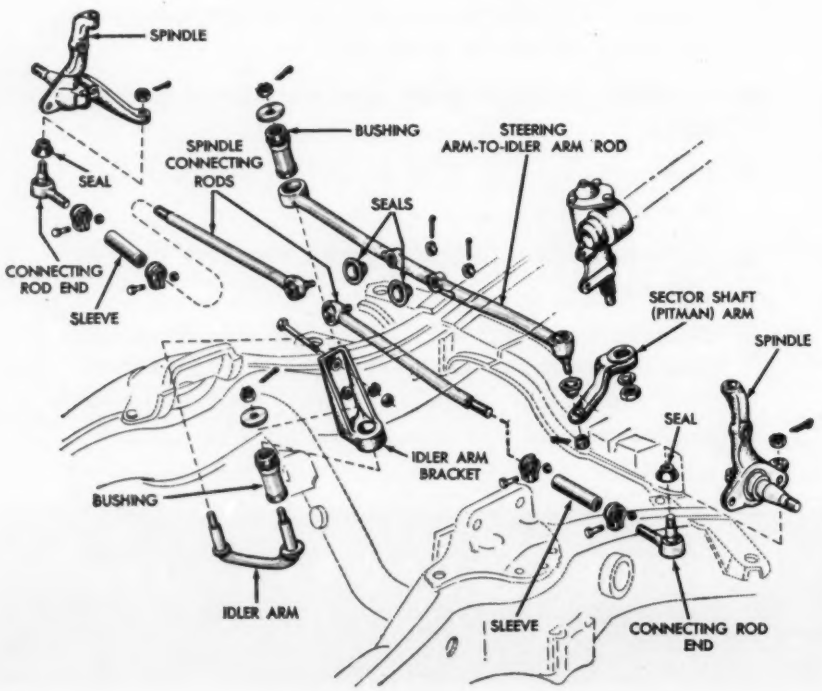
• BRAND NEW ON MANY 1961 cars are the recommendations for lubrication. This applies not only to engines but also to chassis. Owners' manuals on engine oil change intervals run all the way from 2,000 miles for average service on all Chrysler Corp. cars, for example, up to 6,000 miles on the Lincoln for any kind of service. You will also find many modifying instructions, some in fine print, covering engine oil changes for special service. These will be discussed later on in this article.

As far as chassis lubrication is concerned, you will find that on the 1961 Cadillacs there is **none** because all of the lubrication points have been eliminated. On the Lincoln, there are very few and on all the Ford products new lubricants and sealing methods have caused Ford to advise an interval of 30,000 miles between chassis lubrication jobs. How this is done will also be discussed later.

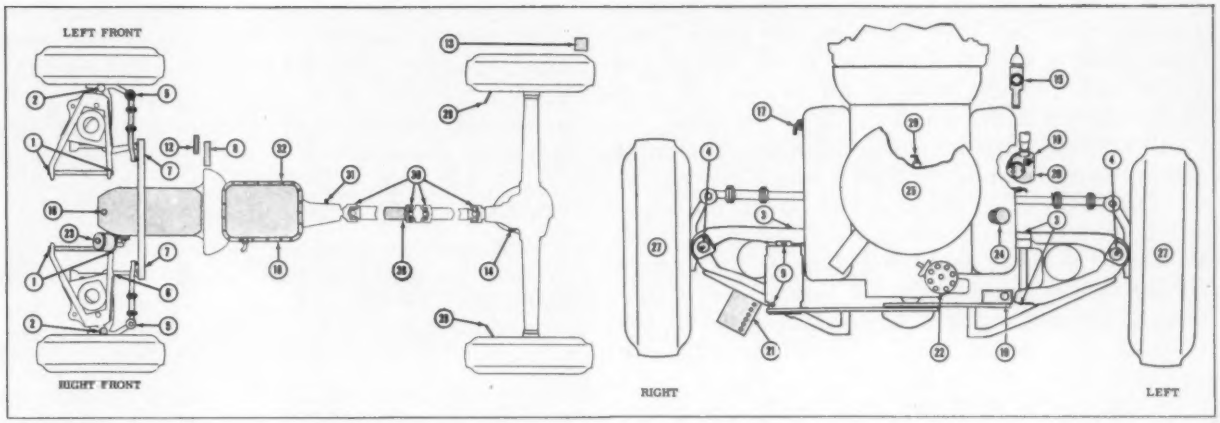
ENGINE OIL CHANGES

A couple of months before introducing the '61 line, all Ford divisions were about to divulge a 6,000-mile interval for oil changes. However, before the announcement went into effect, Mercury announced a reduction of this interval to 4,000 miles. That was shortly followed by other Ford divisions so that with the exception of Lincoln, previously mentioned, all of the Ford units have a 4,000-mile interval. For 1960 it was 2,000 miles.

As with many cars, when a new one is delivered



Exploded view of the '61 Ford steering linkage. The suspension, linkage and drive line features a 30,000-mile lubrication interval, due to better sealing and lubricant containing molybdenum disulphide.



Lubrication and maintenance points on the 1961 Oldsmobile F-85. 1, 2, 3, 4—lower and upper control arm pivot shafts and ball joints; 5—tie rod ends; 6—steering idler arm bushing; 7—relay rod; 8—clutch equalizer; 9—generator; 10—throttle and transmission linkage; 11—parking brake linkage; 12—Synchro-Mesh clutch linkage; 13—fuel tank filler door; 14—differential; 15—brake master cylinder; 16—engine oil; 17—Hydra-Matic; 18—Synchro-Mesh; 19—steering gear and pump; 20—steering (manual); 21—battery; 22—distributor; 23—oil filter; 24—breather; 25—air cleaner; 26—slip yoke; 27—wheel bearings; 28—brake cables.

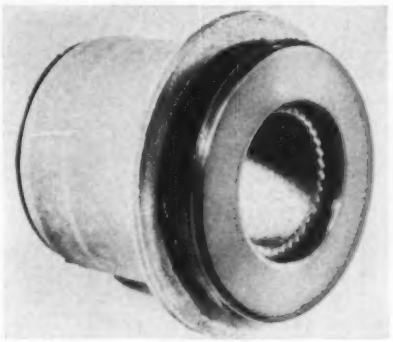
to an owner, Ford engines have break-in oil installed. It is recommended that the dealer, as part of his 1,000-mile inspection requirement, replace the factory-installed oil filter with a FoMoCo full-flow filter. The owner at that time is charged for the oil and the new filter.

In the General Motors group, the recommendation for Chevrolet is 4,000 miles and the same for the Corvair and the Pontiac. For Oldsmobile it is 3,000, Buick 2,000-3,000, Cadillac 4,000 in summer and 5,000 in winter. Rambler recommends 2,000-3,000, depending on conditions. On Studebaker cars for average service, 2,500 to 3,000 miles. On the basic recommendation for average conditions, Chrysler Corp. is uniform across the boards all the way from Plymouth up through Imperial. In all of these, the recommendation is 2,000 miles.

Chrysler recommends that an oil be used which conforms to the requirements of API (American Petroleum Institute) classification "for service MS." Oil recommendations as far as viscosity is concerned are according to the following table.

Anticipated Temperature Range	*Viscosity Number*	*Optional Multi-Viscosity Oils*
Above +32°F	SAE 30	SAE 20W-40
		SAE 10W-30
As Low as +10°F	SAE 20W	SAE 20W-40
		SAE 10W-30
As Low as —10°F	SAE 10W	SAE 10W-30
		SAE 5 W-20
Below 10°F	SAE 5W	SAE 5 W-20

When it is realized that all of these engines are manufactured with about the same degree of tolerance and with similar materials, it is easy to see why the situation has become somewhat difficult for the petroleum refining industry which is made

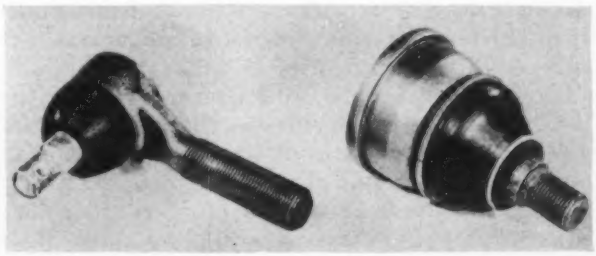


Lubrication fittings as, for example, on the Cadillac '61 chassis, have been eliminated and rubber bushings like these are used at all suspension arm-to-frame attaching points. They require no lubrication.

up of companies that manufacture lubricating oils. The American Petroleum Institute, which includes all the major and most of the minor refiners, includes in its activities an extensive program of research which involves a close study of oil performance in every make of car. After studying the 1961 cars as well as previous models, the recommendation of this organization is: "In summer, change oil every 60 days. In winter, change oil every 30 days, but never exceed 2,000 miles."

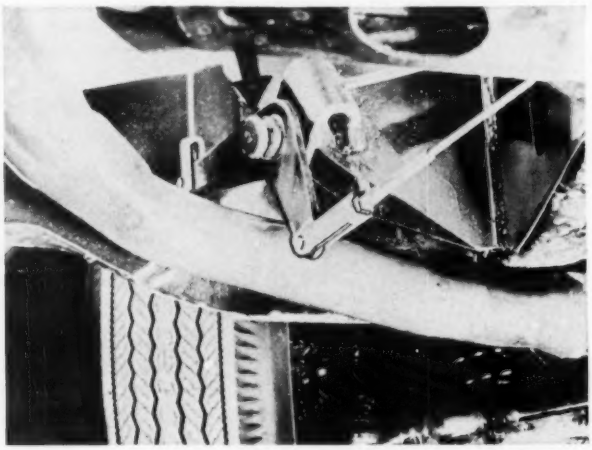
Obviously there is a wide difference between the recommendation of the API and that of the car manufacturers. In discussing the subject with both

The joints on the Cadillac steering linkage use an umbrella-type seal (left), while the seals on the front suspension joints are of the bellows-type.



parties, that is, the oil refiners and the car makers, you may find that they agree on one major basic point. That is, that the frequency of oil changing is not a matter of the make of car as much as it is the conditions under which the car is operated.

All of these engineers are in agreement that most driving today is under conditions which they regard as "severe service." "Severe service" is just the opposite from what most laymen would think it to be. It would be quite normal to believe that severe service is that imposed by the driver who is continually hot-rodding it at anything from 60 to 100 miles an hour across country. However, quite the reverse is true. "Severe service" from the oil man's point of view is short-trip, stop-and-go operation.



On this parking brake bellcrank, a plastic bushing is used, which requires no lubrication.

You are no doubt aware that the container can holding oil for this "severe service" is designated "for service MS." These letters are stamped on the oil container to help the motorists select the right kind of lubricant and these are the oils recommended by all car manufacturers for new-car service today. Other oils are designated "for service MM" (moderate) for older cars driven at high speeds for short distances in warm weather or when long and short trips are alternated in cold weather. Another designation is "for service ML" (light) for older cars driven at moderate speeds in warm climates. The 1961 model year is the first that **all** car makers recommend "for service MS."

After checking with the car manufacturers and noting the many exceptions that are given (sometimes in fine print) in the instruction manuals, it seems to average down to the following program: Change the oil every 3,000 miles where conditions are good, that is in summer months where trips are probably 25 miles or more at speeds of from 30 mph up and with no long idling periods. If the driving conditions are not so ideal, or a number of short trips are mixed with long ones, with occasional bumper-to-bumper driving, change every 2,000 miles in summer. In winter under these conditions, change oil every 1,000 miles. For extremely dusty conditions or in cold damp weather, particularly with short runs, changing oil every 700 miles is not too frequent.

NEW CHASSIS LUBE RECOMMENDATIONS

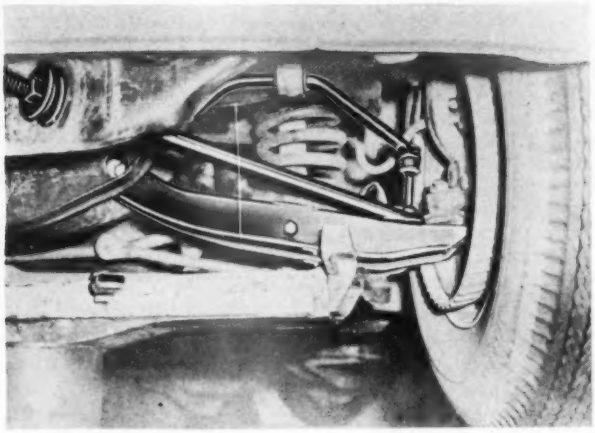
Most radical in the change in its chassis lubrication practice for 1961 are Cadillac and Ford. On the Cadillac, all lubrication fittings have been eliminated from the chassis. In place of the usual lubricating points, the Cadillac engineers have designed parts on the chassis which, they claim, maintain their specified characteristics throughout the life of the car. This has been made possible by the development of an entirely new type of front suspension. Formerly, the suspension arms were attached to the frame through metal-to-metal bushings. Now all suspension attachments are made through rubber bushings which act as road noise and shock insulators. Cadillac engineers state that the insulation is so complete that copper bond straps had to be installed from the suspension to the frame to keep tire static out of the radio.

Another Cadillac change is in the connection of the wishbone type arm to the frame. Formerly this was held rigid by being connected at three points: one connection at the steering knuckle and two at the frame. On the 1961 model, the lower control arm is now connected at only two points, one at the steering knuckle and one at the frame. To stabilize the front suspension a diagonal tie strut is used with each lower suspension arm. The tie strut is connnected at the lower end of the suspension arm and at the front frame cross-member. Using rubber bushings on all suspension components to frame attaching points has eliminated the need for lubrication at these points.

To complete the job, Cadillac engineers have designed a steering linkage and spherical joint so that they are lubrication-free. Spherical joints and steering linkage are lubricant-packed and sealed at assembly. A special lubricant is claimed to have unlimited life, as are the seals. The spherical joints on the steering linkage use an umbrella-type rubber seal while the seals on the front suspension joints are of the bellows type.

Outside of Cadillac, there are no radical changes in General Motors chassis lubrication recommendations for 1961 as compared with 1960. Where slight changes in construction have been made, there are, of course, new locations to be watched but these are all at logical points with no change in basic principles.

For example, on the 1961 Pontiac, lubrication is about the same as that for 1960, although the frame designs on the chassis are entirely different. The 1960 cars use an X-frame whereas for 1961 the



In the 1961 Cadillac front suspension, the lower control arm is connected only at the steering knuckle and the frame as compared with three points on previous models. A diagonal tie strut is used to stabilize the front suspension.

basic frame design is the parallel box type. Incidentally, while the Pontiac owner's guide for 1961 makes no mention of the interval for change of fluid in the Hydra-Matic transmission, this interval is 25,000 miles, the same as recommended for 1960.

FORD CHASSIS LUBRICATION ENTIRELY NEW

The Ford Motor Co. makes no bones about stating that "the traditional grease job for automobiles is now on its way to becoming a thing of the past." They further state that special seals and a special lubricant, introduced this year on the 1961 Ford car line, have lengthened the chassis lubrication interval to 30,000 miles or 2 years. This applies to Lincoln, Mercury and Ford but not Falcon or Comet. Continuing Ford's statement on this new procedure, they state, "At the end of 30,000 miles the customer can return his car to his dealer and for little more than the price of a regular grease job, get a lubrication recharge good for another 30,000 miles."

Each joint and bearing on the Ford line of chassis, now has a lifetime seal which is packed with molybdenum disulfide grease. All grease fittings have been replaced by solid metal plugs.

Ford states that the characteristics of molybdenum disulfide grease are such that it can never be completely wiped off any metal once it has been applied. The grease creates what metallurgists describe as "slippery metal." After 30,000 miles the metal plugs are removed, the joint or bearing recharged with molybdenum disulfide grease, and plugs reinserted. The re-charging is done with a standard grease gun fitted with a special rubber-tipped adapter and takes approximately 20 minutes.

Ford service men also state that the owner can, if he so desires (although it is not recommended) remove the plugs and put in standard grease fittings, as the plugs have the same threads as these grease fittings. However, as long as there is a Ford dealer handy, it is probably expected that the owner will go there for his re-charge. Besides, other greases with either calcium or sodium base are incompatible with the "moly" grease. Mixing kills the lubricating properties.

On the Ford, Lincoln and Mercury, lubrication of the front suspension, steering linkage and universal joint is called for every 30,000 miles.

On the Falcons and Comets it is recommended that front suspension, steering linkage and clutch equalizer bar be lubricated at 1000-mile intervals.

For 1960, chassis lubrication on Ford products was called for every 2,000 miles and universal joint lubrication every 16,000 miles. For 1961 the suspension ball joints are sealed with polyurethane caps. The "moly" lubricant is packed in the chassis fittings at the factory in the following places: two upper ball joints, two lower ball joints, one steering pitman idler arm joint, two steering cross link joints, four steering tie rod ball joints and one power steering valve.

CHRYSLER LUBE PRACTICE STANDARDIZED

One of the advantages of the highly centralized engineering procedure of the Chrysler Corp. is the standard maintenance procedure which runs completely across the boards for all units from the Imperial down to the compacts. This is in line with Chrysler's universal adoption of any design feature that they find advantageous such as, for example, the rubber-tipped carburetor float needle valve, alternator instead of generator, and so on.

Chassis lubrication procedure on all Chrysler division products is based on the schedule of every 2,000 miles, or 60 days, whichever comes first. The location of the parts to be lubricated and the type of

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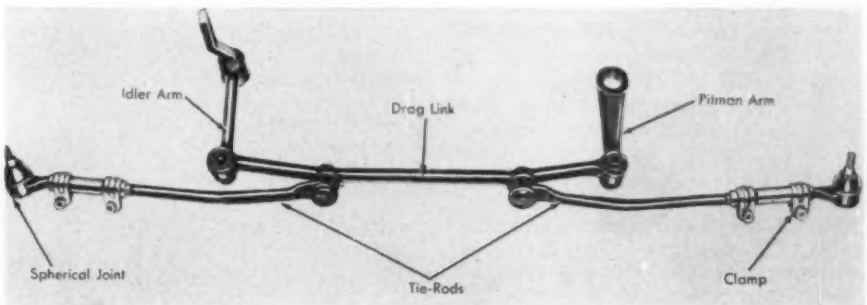


On the '61 Cadillac the tie rod ends serve as connecting links between the drag link and each steering arm. Spherical joints are used at inner and outer tie rod pivots. These joints are lubricant packed and sealed.

BODY REPAIR . . . REFINISHING . . . GLASS . . . TRIM

Appearance Maintenance

Basic principles of sheet metal repair

• THAT PART OF AUTOMOTIVE service concerning the car body is appreciated more fully by car owners because for the most part, the final results are something they can see and understand. A good wheel alignment or valve adjustment may go unnoticed, but a bashed-in side panel not ironed out smoothly and nicely repainted quickly causes a lifting of eyebrows.

And so, appearance maintenance, involving all visible body parts, glass, paint, trim, upholstery and so on, constantly plays a more important part with the ever increasing number of registered motor cars. To that end we reasonably can expect new and improved ways to do "body work", to use an all-inclusive term.

Much of appearance maintenance very often entails a restoration of original shape of body panel contours. A preliminary knowledge of metal handling is, therefore, highly essential.

LARGE CHOICE OF EQUIPMENT

In recent years manufacturers of body repair equipment sensed the need for easier and faster repair methods. The application of these methods has appeared from time to time in these columns and the choice of such equipment is as varied as the shapes of automobile bodies and the different kinds of damage incurred in service.

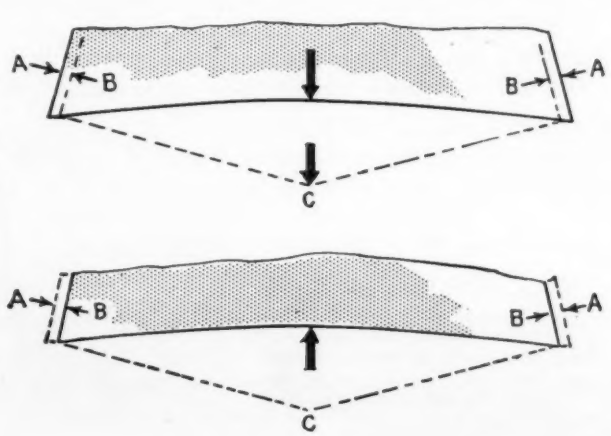
Over the years bodies have been made with highly crowned surfaces, with substantially flat panels, with so-called "sculptured" surfaces incorporating almost every conceivable twisting of metal, slightly rounded contours and so on. Present designs take into consideration the unitized type of body construction, wherein the old time "frame" and body are molded into a single structure.

Regardless of the type of body, shape, and where metal is used, there are some fundamental or basic things that apply in the repair methods. These naturally are familiar to the old timer in a body shop. The same basic principles of sheet metal repair must become known to the newcomer in the body shop. While modern repair equipment makes it possible for the somewhat inexperienced body man to do a passable job, the fact remains that a knowledge of how metal behaves under certain conditions is a *must* in that phase of automotive service work coming under the general heading of "appearance maintenance".

With that in mind, let's discuss the behavior of metal. In the first place, metal used for bodies, hoods, fenders and other parts is cold rolled steel, with a low carbon content. Obviously it must be soft enough and ductile enough so flat sheets can be drawn or pressed into suitable shapes in dies at the car factories. Naturally the same properties of the metal that allow it to change shape during fabrication of parts, also permit it to undergo changes in shape when cars are damaged by accident or otherwise. Going a step farther, the same properties allow the body man to straighten the metal. If this were not true there could be no repairing or straightening of sheet metal.

THE TENSION METHOD

In connection with the development of body repair equipment, the Blair Equipment Co., Flint, Mich., some time ago presented excellent basic information about sheet metal characteristics and straightening procedures. In it, the statement was made that removing damage from the sheet metal by applying a tension method, for example, is as easy as taking the wrinkles out of a bed sheet. The basic



Sufficient force applied to push center of panel C, pulls edges A inwards to B. If panel is forced back, distortion and buckling results as metal "shortens up."

principle is the same. That is, patting the wrinkles in a sheet is a poor way to remove them. When you pull across them, they disappear. Likewise, pull across damaged sheet metal and the reaction is much the same.

Automotive Service Digest is indebted to the Blair company for much of the following information on the elementary principles of sheet metal repairing. Even though the dolly block and hammer have given way to other repair approaches, due to body design changes and progress in equipment, certain basic procedure is worthy of passing on to the beginner and as a reminder to the old timer.

Any deep indentation of a flat panel tends to draw its edges inward or closer together. Hence, to correctly repair these edges, they must be moved outward or back to the point from which they were moved. The old method was to push or drive against the under side of the deepest part of the dent.

Editor's Note: **Beginning in this issue, Appearance Maintenance becomes a regular monthly feature of *Automotive Service Digest*. The ever-increasing predominance of so-called "body work" in all its ramifications, has prompted this decision on the part of the editors. Each month some pertinent subject will be presented with the hope that it may prove helpful to that branch of the service industry dealing essentially with car beauty, comfort and driving appeal.**

That would be OK, excepting that the outer edges just don't go all the way back. The point at the bottom being pushed or hammered upon shortens up and ties the edges closer together. This was not too serious with the former higher crown panels, but on flat panels it is much like patching a hole in a bed sheet by pulling the edges together and sewing them. Of course, it will close the hole, but the sheet will not lie smoothly on the bed. A similar situation is created in a flat body panel, unless the outer edges are brought back to their original position.

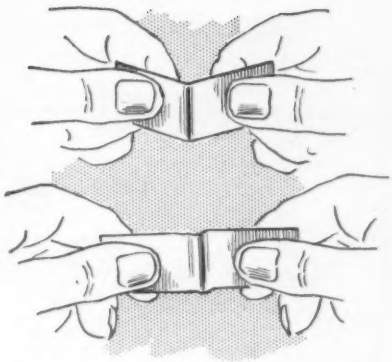
The foregoing is shown in one of the illustrations. If the dent is pushed up at C, and if there were no resistance to outward movement at its extremeties, the panel would move back freely to its original position. That is, distance B-B, would be restored to distance A-A.

However, the outer edge may be a door facing, pillar or other reinforced section which does not freely move. Thus, if the panel is forced to its original position (height) in a now restricted space by pressure applied at C, distortion and bulging results. The metal shortens up in spots, creating what body men call "knots". These are troublesome, being similar to the bed sheet previously mentioned and which does not lie flat because of sewing the hole together.

BECOMES HARDER AND STRONGER

Sheet metal when worked becomes harder and stronger. This increase in strength is called *work hardening* and may easily be demonstrated with a small piece of metal. The latter is bent in the middle and then straightened again. The metal does not straighten as easily as it will bend. The fact is, a buckle will be left since bending made it stronger.

Stretched metal can be caused by high speed impact of a small rigid object, as on the surface of a panel. Excess use of a bumping hammer on a dolly block also can stretch metal. Stretching rarely is caused by using a body jack.

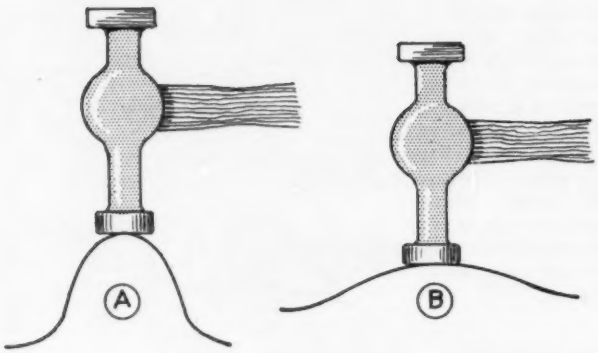


It is easy to bend a piece of sheet metal, but it cannot be straightened as easily, due to what is termed work hardening. *A buckle appears because the bending made the metal stronger.*

Upset metal can be caused quite easily by jacking against the underside of a sharp dent or hammering against a buckle. Under such a condition, a great force is concentrated on very small areas. Naturally, shortening of a small area in a panel that should, when straightened be nearly flat, causes the adjoining area to bulge.

Upset conditions are a problem to the sheet metal man. First, it is diffi-

In the process of metal repair, the work falls into three progressive operations, shown here. These are (1) roughing out; (2) bumping, and (3) finishing. Fulfillment of these three operations is accomplished by varied equipment, that shown being typical.



A hammer should never be used on a sharp buckle, A; a certain amount of straightening should first be done, as at B.

cult to recognize them and secondly, there is the difficulty of correctly relieving them once they have been recognized. Repair operations and procedures should be planned so existing upset conditions will be relieved and additional conditions will not be caused. It is not uncommon for a bulged condition (caused by an upset in an adjoining area) to be mistaken for a stretch.

In sheet metal repair the work is divided into three general and logical classifications or operations. These are (1) roughing-out (2) bumping and (3) metal finishing. If body openings have to be aligned, it will be done in connection with the roughing-out work.

ROUGHING OUT MOST IMPORTANT

Equipment manufacturers stress that roughing out is the most important of the three operations in straightening damaged sheet metal. The right kind of roughing out procedure leaves the minimum amount of work in the bumping and finishing operations. Skill in roughing out is an essential ability of the above average man. By taking an intelligent approach to the job he can cut the average man's time in half or make a profitable repair job out of a panel that would otherwise be considered scrap.

Obviously, the conditions of the damage will determine whether roughing out can be done with hand tools or will require jacks and clamps or tension plates. The governing conditions that must be considered are the original shape of the damaged area and the severity of the damage.

DOUBLES WORK TIME

Very small damage may be knocked out in most any way and the total working of the metal will not be enough to cause serious ill effects. Poor roughing out of many damged panels can double the amount of work necessary to complete the job. This means the body shop sells its time for half price.

To better understand roughing out consider all damage as a *folded* condition caused by an application of force. The roughing out procedure then logically becomes an *unfolding* operation. Thus, roughing out is simply the use of force to accomplish the opposite of the effect of the damaging force.

The need for final straightening with hand tools can be demonstrated with two strips of metal with a sharp bend in each. Make a pull set-up, using a body jack and two sheet metal clamps. Straighten one of the bent strips by pulling on the ends; most of the buckle will pull out, but not all of it. If enough tension is applied the strip can be pulled into two pieces, but at least a trace of the buckle will remain. The piece will not pull straight, nor will it break in the bend.

Now straighten the other bent strip by pulling in the same manner, but do not use excessive force. Instead apply just enough force to pull the strip tight. Then, hold the crowned face of a dolly block on the underside of the buckle and hammer down on each side with a bumping hammer. Enough upward force should be exerted on the dolly block to lift the buckle slightly as the hammer strikes. The effect will be to straighten the buckle and relieve the jack tension. Constant tension should be maintained as the straightening progresses. The result will be that the strip will be straightened completely with relatively little force. The key point is that force was correctly used. The jack and clamps were maintaining the essential tension that made the final straightening with hand tools easy.

The procedure just given is an example of one of the principle uses of the body man's hammer and dolly block — hammer-off-dolly. Essentially it is a straightening operation in that force is applied to both sides of the metal at the same time. The hammer pushes downwards and the dolly pushes back against the hammer blow at an adjoining low spot.

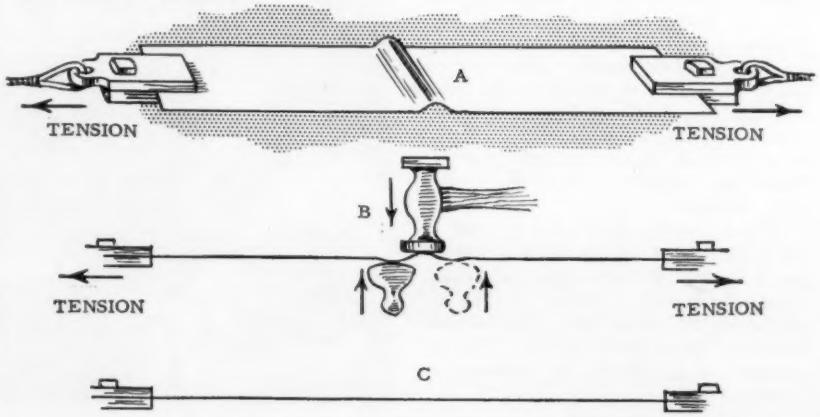
USING HAMMER AND DOLLY

Correct use of the hammer and dolly involves the selection of the right places—high and low spots—on which to use them. In most cases these spots will be rather close together, but spots can be worked as far apart as an inch and even more. More often than not, the places to be worked on are long lines, such as ridges and adjoining valleys, instead of single spots. The procedure is to start at one end and work progressively along the ridge with the hammer and along the valley with the dolly.

Use of the hammer-on-the-dolly is also an important procedure in reshaping metal. Hammering on the dolly to excess should be avoided. However, a study of conditions that exist after a panel has been damaged and roughed out will reveal areas that have been upset. It is necessary to stretch metal in such areas to restore them to the correct contour. The most effective way to do this is to go over them with correctly spaced hammer-on-dolly blows.

The right procedure for stretching such areas is to cover them with a

Application of tension is shown at A to a piece of buckled metal. Tension alone, even severe, will not straighten it. With the same tension constantly appplied, the buckle can be straightened by hammer and a dolly block, B. The metal strip can thus be completely straightened, C.



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Address ____ Mfr. No. ____ Adjusting Co. ____ Claim No. ____

Phone (Home) ____ (Bus.) ____ Mileage ____ Adjuster ____ Phone ____

License ____ Model ____ Body Style ____

Operation No.	Description of Work	Parts Prices	Labor: Body	Labor: Mech.	Labor: Paint	Total Labor

THIS IS NOT A BILL – ADVANCE ESTIMATE ONLY

This estimate is based on the initial inspection. It does not cover additional parts or labor that might be required after the damaged sections have been removed. Occasionally, worn or damaged parts are found after work has been started which were not evident on the initial inspection, in which case the insurance company will be notified.

Estimated by ____ Date ____

Remarks ____

TOTAL ____ $____

Total Parts Prices ____ $____

Total Body Labor @ ____ Hour ____ $____

Total Mech. Labor @ ____ Hour ____ $____

Total Paint Labor @ ____ Hour ____ $____

Paint & Material ____ $____

Towing & or Advanced Charges ____ $____

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Total Repair Estimate ____ $____

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uniform pattern of hammer-on-dolly spots. Work back and forth in rows, striking harder blows in the center area than on the edges. The exact spacing of the spots is a matter of judgment based upon experience. In many cases the space between the spots can be equal to the diameter of the average spot. Others may require complete coverage.

An important factor in the use of the hammer-on-dolly operation is the selection of the face of the dolly to be used. It should have enough curvature to rest on the inner side of the metal in a small area, but the curvature should not be round enough to cause it to bite into the metal when a sharp hammer blow is struck against it. A general purpose dolly having a working face that blends from a low to a high crown is usually sufficient for most work.

NEVER STRIKE SHARP BUCKLES

Minor ridges remain where the sharper buckles have been when panels are roughed out, whether by pulling or pushing. It is important to use the right procedure to remove these if they are to be straightened without excessive work. One positive rule that should never be violated is to never strike a sharp buckle until it has been pulled as nearly as possible into shape. One of the illustrations defines this. Shown, in the one case is a degree of bending that would be classed as a sharp buckle. The illustration along side it represents the amount of straightening that should be done before the buckle should be hammered to finish straightening.

Generally a sharp buckle will taper

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off into an area of undamaged metal. Work on these should start at the end where buckling can be first observed and should move progressively inward. Whether the work should be done with the hammer striking directly against the metal, or a flat spoon should be used between the hammer and metal is determined by the rigidity of the area.

If it is relatively rigid, the flat spoon is indispensible; it will spread the force of a stiff hammer blow over a relatively large area. If it is loose and floppy, the hammer face should be used directly against the metal. There will be exceptions to this, but in general, the rigid areas will be those that are relatively flat in one direction and have considerable curvature in the other. The floppy areas will be those that are relatively flat in both directions. In the case of a long buckle, several passes should be made across it, each pass consisting of a series of hammer or hammer and spoon blows, which will partially straighten the buckle. This is more satisfactory than attempting to work all of the buckle out in a single pass.

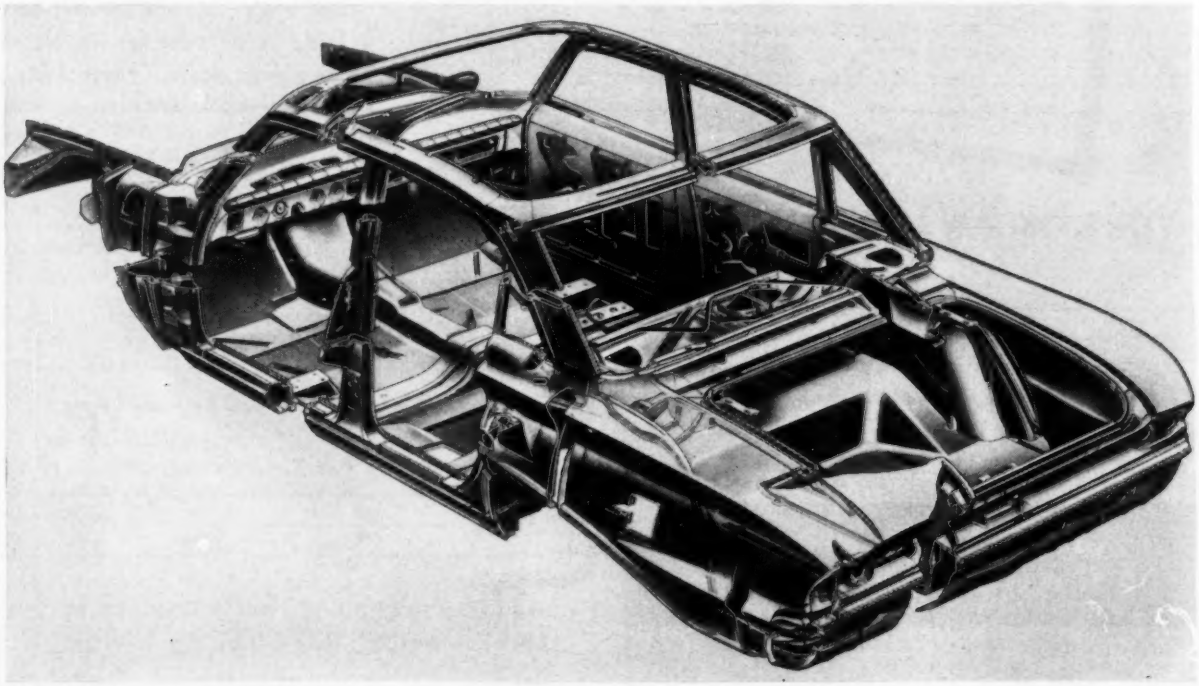
An upside down buckle is known as a "valley." The same basic reasoning that applies to the straightening of a ridge applies to a valley. It is especially bad practice to raise the metal in a shallow valley by picking with a sharp pick hammer if it is possible to get to it with a smooth tool such as the face of a dolly block.

In recent years impact pull tools have been introduced for body work and which materially simplify procedures especially with welded construction used on many of the modern cars. Most of the work is done "from the outside". Future articles in Appearance Maintenance will cover these and other new developments.

Distributor Oil Leak

Should an oil leak be encountered between the distributor and cylinder block on Plymouth or Valiant engines, remove the cork gasket or large rubber "O" ring under the retainer flange on the distributor and install two rubber "O" rings as follows: Position a small "O" ring (Part No. 2095630) on the distributor housing against the retainer flange; then install the large rubber "O" ring (Part No. 2095740). Reinstall distributor and set ignition timing.

Structural details of a modern automobile body. Shown is the 1961 Oldsmobile F-85. As body design and methods of fabrication change over the years repair operations are correspondingly altered for simpler and more effective procedures.



Torquing head aids lubrication

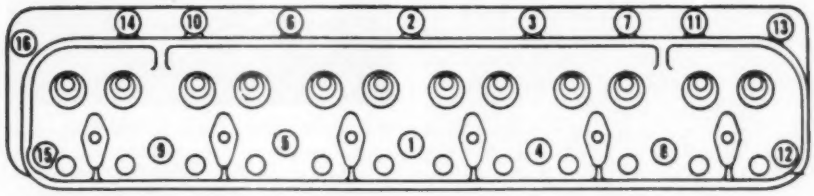
• RAPID CYLINDER WALL and piston ring wear can often be prevented through the use of a dependable torque wrench. During engine operation, extreme heat and pressure are always present at the cylinder walls, pistons, and piston rings. These hard-working areas of a modern engine represent a critical problem to the lubrication engineer. Adequate lubrication at the piston-ring-to-cylinder-wall contact point is vital and often difficult to maintain. Insufficient or incorrect lubrication at this point results in accelerated wear of the cylinder walls and piston rings.

Service engineers of the P. A. Sturtevant Co. remind mechanics that incorrectly-tightened cylinder heads can destroy the cylinder wall oil film by permitting engine coolant to seep past the gasket and into the cylinders.

Once in the cylinders, the coolant tends to wash away the cylinder wall oil film and permit metal-to-metal contact between piston rings and cylinder walls. These service engineers have calculated that a single drop of water in a cylinder chamber will accelerate ring wear three times that of normal. This water-in-the-cylinder condition can exist with any type of engine coolant, but is most likely to occur in engines using permanent-type antifreeze.

To prevent this from happening, it's important to tighten the cylinder head capscrews, or nuts, to manufacturer's specifications using a torque wrench. It's important, also, to tighten down the cylinder head capscrews, or nuts, in the sequence recommended by the engine manufacturer. A typical tightening sequence is illustrated. Note that the sequence calls for tightening capscrews at the center of the cylinder head first, and then working alternately away from the center toward the edges. This is to assure the cylinder head will make solid contact with the engine block (through the gasket) at all points of the mating surfaces.

Tightening the cylinder head capscrews at the edges first and then working toward the center could cause a "bubble" effect at the center of the head with the resultant loss of adequate sealing. Correct tightening sequence and tightening torque of a cylinder head is a "must" to assure adequate sealing and to avoid possible distortion of the head and cylinder assembly. Never tighten a cylinder head by guess. Follow the manufacturer's specification and use a torque wrench.



Typical cylinder head bolt tightening sequence. It's done by working alternately away from the center towards the ends.

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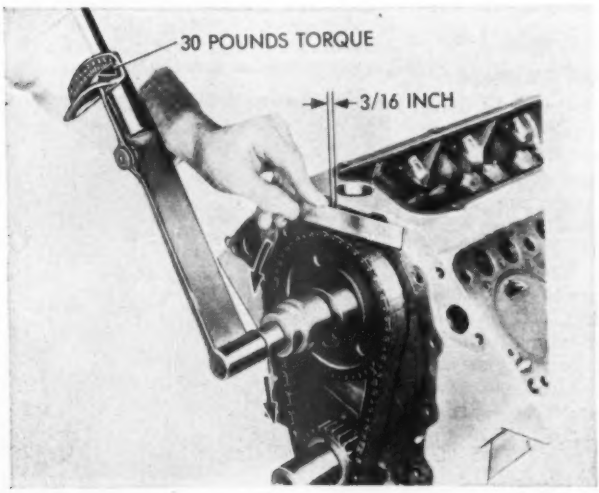
Torque—checking timing chain

• THE TIMING CHAIN performs a critical part in engine performance. Slight variations of timing chain tension result in considerable operational variation of both engine valves and ignition timing. When checking out all variable performance factors, which influence engine operation, the timing chain should be checked carefully.

This check can be performed during engine overhaul, (or any time the engine's chain cover case has been removed) *without removing the chain from its sprockets.* All that is required to make a quick, accurate test is a dependable torque wrench and a steel scale. To make the check:

1. Block the crankshaft so that it cannot move in either direction.
2. *Apply 15 ft.-lbs., torque* to the camshaft bolt in a counter-clockwise direction. If the cylinder heads are *installed, apply 30 ft.-lbs. of torque.*
3. Place the steel scale next to the timing chain and take a reading of the chain position.
4. Keep the scale stationary and apply 25 ft.-lbs. of torque to the camshaft bolt in the clockwise direction with the cylinder heads removed, or 45 ft.-lbs. if the heads are installed.
5. Note the amount of chain movement on the scale. The chain should be replaced if total movement exceeds 3/16 in.

Make sure the crankshaft is securely blocked against rotation when torque is applied. Any movement of the crankshaft would result in an inaccurate test of the timing chain condition.



Set up for testing timing chain condition. Crankshaft must be blocked to prevent rotation.

Adjusting Chrysler Front Wheel Bearings

Chrysler Corp. has revised its recommended procedure for adjusting the front wheel bearing on all 1960 Chrysler and Imperial Models, as follows:

1. Tighten the wheel bearing adjusting nut to 90 in.lb. torque while rotating the wheel.

2. Position the nut lock on the nut with one pair of slots in line with the cotter pin hole.

3. Back off the lock and adjusting nut to the next slot and install cotter pin. *Note*: The resulting adjustment should be zero to .003" end play.

4. Clean grease cap, coat inside with wheel bearing lubricant (do not fill) and install.

Switch to chrome-nickel spray powder ups rebuilt crankshaft production 50%

. . . permits cost saving of more than 45%

• CRANKSHAFT REBUILDING has been given a boost within the past two years with the introduction of Colmonoy* C-290 metal spray powder. Using this new material, Engine Rebuilders Corporation of America, an authorized Ford engine rebuilder in Fair Lawn, N.J., has realized a cost saving of more than 45 per cent and a production increase of approximately 50 per cent as compared with the metallic spray bonding method formerly used.

The C-290 powder, a patented material, is high in chromium and nickel and contains wear resistant chromium borides. It is applied by conventional spray metallizing methods, using the Colmonoy Spraywelder unit.

COST PROVED PROHIBITIVE

In the previous method used by Engine Rebuilders, worn journals were built up by conventional wire

Fig. 1. Crankshafts are steamed and detergent cleaned prior to entering solvent cleaner.

methods wherein total build-up was of molybdenum. The cost per journal of $2.50, exclusive of grinding costs, was prohibitive with this method.

In an effort to reduce rebuilding material costs, Engine Rebuilders tried a very thin base of adherence molybdenum overlay, then sprayed stainless steel on top of it. When it was found that the stainless steel would not satisfactorily adhere to the molybdenum, high carbon steel was tried, but this material, too, tended to separate from the molybdenum undercoat.

It was at this point that the possibilities of the C-290 powder were investigated. The rebuilding firm found that this material demonstrates an excellent adherence to molybdenum. In addition, application with the Spraywelder cut actual spraying time to a maximum of 2 minutes and cut the rebuilding costs to approximately

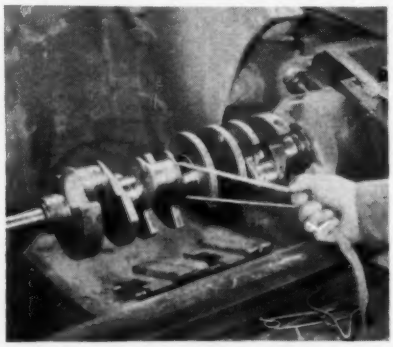


Fig. 2. Crankshaft is mounted in crankshaft grinder. Operator holds strip of emery cloth against crankshaft journal to insure a bright, clean surface prior to preheating for molybdenum wire metallizing.

$1.30 per journal, before grinding. These are average figures, of course, because mains require more time and material than throws, and because a certain amount of set-up time is required for a crankshaft whether there are four journals to rebuild or only one. The significant comparison to make in this case is daily production, and Engine Rebuilders now turn out from 23 to 27 crankshafts per day as compared with 16 to 18 using the previous method.

REBUILDING PROCEDURE FOLLOWED

When preparing to rebuild with C-290 powder, the crankshaft is first degreased, using steam, detergent and solvent (Fig. 1). Worn journals are then ground .060″ undersize (.030″ per side). The crankshaft is placed in a crankshaft grinder and adjusted for journal concentricity. With the crank rotating, a strip of emery is placed around the journal (Fig. 2). The operator pulls on both ends in a manner that assures removal of all rust and foreign matter. Oil holes are then plugged with carbon. The carbon plugs project about 1/16″ above the

* *Registered trade mark*

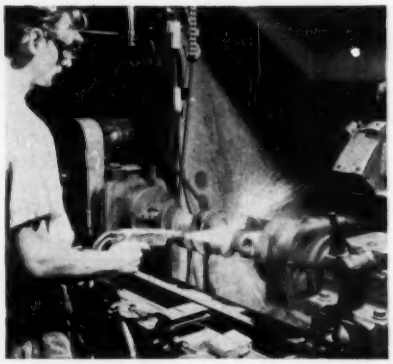


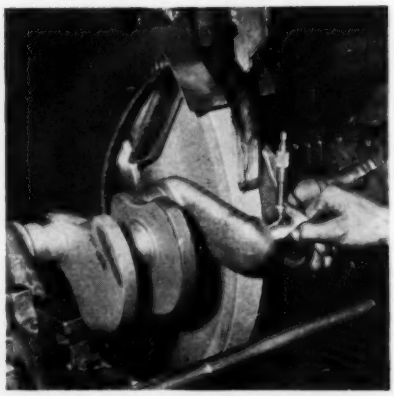
Fig. 3. Colmonoy C-290 powder is applied by spraying with Spraywelder unit. Use of this technique has permitted production increase of 50 per cent and cost reduction of more than 45 per cent.

journal surface to facilitate removal following the spraying operation. Asbestos wicking is used by some C-290 users to protect oil holes during metallizing, but this rebuilding firm prefers carbon plugs because they are easier to insert and remove.

A base adherence overlay of molybdemun wire is then sprayed onto each undercut journal. This overlay provides a rough surface for the subsequent C-290 deposition. Prior to spraying the molybdenum, the journal is preheated for about 10 seconds with the flame from the wire gun. Normally a single traverse, back and forth, is sufficient to establish the required .003″ to .005″ molybdenum deposit. All undercut journals are sprayed with molybdenum before proceeding with the C-290 application.

When there is more than one journal to be rebuilt, each molybdenum overlay in turn is preheated with the Spraywelder pistol for about 5 seconds. The C-290 powder is then sprayed onto the molybdenum base surface (Fig. 3) to a thickness of about

Fig. 4. Grinding crankshaft following metallizing with Spraywelder. About .010″ per side of protective C-290 coating is removed during the grinding operation.



.010" greater than the required finished overlay (.020" on diameter) to allow for finish grinding (Fig. 4).

VERY LITTLE OVERSPRAY

Because of the narrow cone spray pattern of the Spraywelder, adherence of C-290 powder resulting from overspray is sharply limited. The rebuilding firm considers this a distinct advantage since use of wire metallizing produces a much larger overspray pattern of adhering deposits on the sides of the cranks. This kind of time-consuming clean-up operation can add considerably to rebuilding labor costs.

An auxiliary advantage realized by Engine Rebuilders since switching to the Spraywelder application of C-290 powder has to do with the labor force. One man previously was assigned exclusively to crankshaft rebuilding. With the improved production picture, he is now able to spend a day and a half or two days each week on cam rebuilding assignments.

In addition, use of the Spraywelder has brought about a significant reduction in operating noise. The noise level of the wire gun, when a full-thickness molybdenum build-up was being used, was objectionable to neighboring workers and necessitated putting the metallizer on the night shift. With the wire gun now used only for the thin base overlay, the metallizer has been able to return to the day shift, producing a saving of the 10 per cent night work bonus.

Check Wire Harness on Valiant Dimmer Switch

On early built 1961 Valiant cars, the parking brake cable was routed on top of the foot dimmer switch wiring harness. This condition tends to pinch the wiring harness between the cable housing and the floor pan and could eventually result in damage to the wiring insulation.

To prevent this from happening, pull the floor mat or carpeting aside at the dimmer switch and disconnect the wiring harness by removing connector from switch. Then lift the parking brake cable housing up and route the wiring harness over the top of the cable, then plug the wiring harness in at the switch.

Gas Turbine Engines . . .

(Continued from page 17)

jected into the atmosphere at about 740°, roughly the temperature of exhaust gases from a conventional passenger car engine.

The power turbine shaft, through a step-down gear arrangement, turns the drive shaft at 4,600 rpm at full power.

The Ford 704 gas turbine engine is designed to burn .56 lbs. of fuel per brake horsepower per hour at full power, .48 lbs/BHP/hr at half power, and .58 lbs/BHP/hr at one-quarter power.

A big advantage of the turbine engine is its compactness. The cubic dimensions of GMT 305 is 16 cu. ft. A corresponding gasoline engine would measure 25 cu. ft. and the Diesel engine, 50 cu. ft. By the use of the regenerative system, where all the possible heat is extracted from the air for useful work, exhaust temperatures are relatively low, that is from 300°-500° F. Exhaust pressures are so low that the engines are quiet and do not require a muffler. Also, no cooling system is needed as all residual heat is rejected into the exhaust. In the earlier days, the high exhaust temperatures were considered to be a definite draw-back to the turbine.

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A natural question is, since the turbine has all of these advantages, why are they not immediately being put into passenger car and truck production. George J. Huebner, Jr., executive engineer in charge of research for Chrysler's engineering division, gives an answer to this logical question. He states:

"We know that the successful application of gas turbines encounters various, if not totally different, difficulties depending on the intended use; and we assure you that, beyond the shadow of a doubt, **the most difficult job of all consists of operating a gas turbine in a passenger car.** To develop a passenger car turbine means certainly to concentrate on the application which is the most challenging from the standpoint of engineering skill but more important than this, it is the most representative from the standpoint of manufacturing and operation. Through passenger car application, this power plant can enter the transportation life of practically all Americans and may eventually be counted in tens of millions. Only this way, by using the passenger car engine tooling as a production base, can the unit cost be reduced to a dollar level which will place it in common use."

Testing Resistor Spark Plugs

When testing resistor-type spark plugs in a spark plug tester where the spark is observed visually, remember that the spark of a resistor plug will not be as visible as that of a non-resistor plug.

According to Champion Spark Plug Co., the resistor eliminates high-frequency oscillations which produce much of the light and noise in a non-resistor spark plug. Consequently, resistor plugs require closer observation to determine the actual quench point for accurate comparison with a new one.

Resistor plugs should be tested in the same manner as regular type plugs—but remember to compare a resistor plug to a resistor plug, and not with a regular plug. Otherwise, you may be throwing away perfectly good plugs.

"Flat Spots" on 1960 Buick

Buick Service has received a few reports of "flat spots" with the 1960 two-barrel carburetor under certain operating conditions.

These "flat spots" are said to be due to incorrect positioning of the air cleaner inlet tube so that the force of air from the fan causes a pressure build-up in the carburetor. To prevent this, the factory recommends that the inlet tube be turned to a position of 44° to the left of the engine centerline. In this position, the word "front" stamped in the cleaner cover will face the front of the car.

These air cleaners are equipped with a new type of air filter element made of polyurethane and look like a synthetic sponge. Buick originally recommended that these elements be cleaned only with nonflammable solvents, but now approves the use of kerosene or petroleum spirits, *provided* strict precautions against fire hazards are observed at all times.

By J. EDWARD SCHIPPER
Detroit Editor

Spokes from the "hub"

● THE TROUBLE SHOOTING Contests inaugurated by Plymouth Division over a year ago are growing in popularity. George J. Cutler, director of service for Plymouth, has announced that the Trouble Shooting Contest is expanding to 25 or more cities throughout the country in 1961. Last year 19 contests were held. It is estimated that more than 1,200 outstanding young automobile mechanic students will participate in the 1961 contests. The Trouble Shooting Contests are events in which top automobile mechanic students, selected by their schools, compete against teams from other local schools to see which can first diagnose and remedy malfunctions deliberately placed in cars. Local contests get under way early in the Spring. The Boards of Education in 18 major cities are working with Plymouth Division on plans for 1961 Trouble Shooting Contests.

* * *

While the country is becoming alarmed about unemployment, there are jobs for one-quarter million automobile mechanics which are going begging. Edwin R. Stroh, vice president Electric Autolite Company, is urging that the industry concertedly launch a massive program to recruit and train the needed quarter of a million men in the field.

* * *

Pontiac recently put one of its new Tempest sedans and a station wagon on a rugged 107-day driving test. The drivers were teen-age college students who had instructions to "keep the cars moving 24-hours a day—treat them rough but stick to the traffic laws." The test run carried more than 100,000 miles through 48 states and 7 Canadian provinces. Pontiac estimates that this was equivalent to 7 or 8 years driving. The teen-agers, driving in relays, gave the two Tempests only the maintenance procedures recommended in the owner's manual. Plugs, points, and fuel filters were changed every 12 to 15 thousand miles. Brakes were adjusted twice.

* * *

The experiment being conducted in Connecticut to use multiflora rose bushes as a barrier between lanes of a divided highway are not as yet convincing. Using a 1961 Dodge Dart, test driver Patricia Jones, 31, a veteran of nearly 600,000 miles of driving in thrill and safety shows, penetrated the bushes three times at different speeds and different angles of approach. Connecticut Highway Commissioner Howard Ives was reported not to be discouraged. He is quoted as stating that a double row of hedges planted more closely together could prevent head-on collisions—one of the major causes of highway deaths. He pointed out that the bushes planted in 1955 on the Wilbur Cross Parkway, were not as yet fully mature and were planted four feet apart. The bushes cost less than $1 a foot, compared with $4 to $5 a foot for the steel-rail type barrier.

* * *

Automotive sales executives are anticipating an increasing demand for air conditioning in spite of the popularity of the compacts. Even the bus companies find that passengers are willing to wait until an air-conditioned bus comes along to take them to their destination. Karl Schuster, air conditioning expert in GMC's Engineering Division, said that over 35 per cent of the 3,500 new city and suburban bus models built by GMC in the past 15 months have been ordered with air conditioning. Air conditioning is, of course, a standard item in inter-city buses, he explained, but it has never reached this level of popularity in coaches used only in city service and short suburban hauls.

* * *

The National Academy of Sciences-National Research Council has published a comprehensive document covering 15 research reports on nighttime driving hazards and how to reduce them. Among the major findings were these:

(1) That motorists who drive too close to the car ahead leave themselves less than a second to avoid an accident.

(2) That missing three hours of sleep while driving at night can produce uncontrollable drowsiness in nine out of ten drivers.

(3) That the glare of bright lights may rob a motorist of his vision from five to seven seconds.

(4) That it takes about 20 minutes for the eye to adjust to darkness, but the adaptation can be shattered in a second by a bright light.

(5) That motorists at night sometimes pass another automobile only 200 feet—or with only 1¼ seconds to spare—ahead of an on-coming vehicle.

* * *

Detroit has been buzzing with various questions and conjectures regarding the announcement made by the Board of Directors of the Automobile Manufacturers Association that the next National Automobile Show will be held in 1962 at Cobo Hall. L. L. Colbert, president of the Association, said an exact date for the show has not been set.

A prominent executive of one of the major automobile companies stated that the real reason behind not committing the industry to a national show for 1961 was because labor contracts expire in September of that year. At this time it is impossible to predict that agreements will be reached which will establish a continuity of production at the normal announcement period. As some time is required to establish reservations for a national automobile show, the

chances that one will be held for the purpose of announcing the 1962 models is just about nil. Of course, the dealer shows throughout the country will go on as usual.

* * *

Studebaker-Lark is doing very well in fleet sales, according to L. E. Minkel, Studebaker Packard Corp. Vice President of Marketing. He cites the purchase of approximately 600 new Larks by the state of California bringing the total in that state to 1200 since the introduction of the Lark in 1959. A. E. FitzPatrick, Fleet Sales Manager, also noted that during the past month 300 Studebaker taxi cabs have been sold in New York City, where a considerable number are now already in use. Nation-wide Studebaker's taxi sales have increased 25 per cent in comparison with a year ago.

* * *

The U. S. Post Office is continuing to order additional Forward Control "Jeep" FC-170 trucks. Twenty-four more of these units have been ordered recently to add to the 100 now in service. All are equipped with stake bodies and electro-hydraulic tailgates for raising heavy mailboxes from the ground to the truck bed. Those designated for cities and cold climates also will be equipped with snow plows.

* * *

Also indicating the continuing progress of the U. S. Post Office Department in motorizing its fleet, a $2,354,315 contract for the production of 1,000 Dodge trucks for that department has just been awarded to Chrysler Corporation. First pilot models of the new trucks will be turned out in the latter part of January. These are three-quarter ton Dodge parcel delivery trucks equipped with forward controls and Chrysler's new slant-six.

* * *

U. S. 1960 passenger car production passed the six million mark during the third week in November, according to the Automobile Manufacturers Association. Passenger car output for the year through Nov. 26 climbed to 6,097,807 units. During the same period 1,097,004 trucks and 3,790 motor coaches were produced. This is more than a million units above the output for the same period in 1959.

* * *

While aluminum is holding the spotlight featuring the introduction of the lighter metals in automotive practice, there is also a growing use of a still lighter metal—magnesium. Just for example, the Lancer's instrument cluster housing and heater-defroster-transmission control housings are made of magnesium. This is the only car introduced by the Chrysler Corporation which uses this metal. Magnesium is only ⅔ as heavy as aluminum. The world's supply of magnesium is inexhaustible. It is drawn from sea water and one bathtub full of sea water holds a pound of the metal. Dodge's Chief Engineer makes this illuminating statement: "If magnesium were produced at the rate steel is today, and if this production were continued for 1,000 years, the magnesium content of the world's oceans would be reduced by only one hundredth of one per cent."

* * *

An all-butyl rubber passenger tire has just been introduced by U. S. Royal under the name of Butylride. Butyl has the advantage of superior traction and because of its inherent qualities, develops an extremely quiet ride with no squeals on turns. According to G. Raymond Cuthbertson, vice president and general manager of the tire division, "Development of the tire called for different concepts of tire design in order to take advantage of butyl's inherent characteristics. Instead of the usual seven-row tread, the Butylride has a single heavily-inserted center rib almost the full width of the tread to provide maximum stability." This is a low profile tire with an oval-shaped cross section. It comes with a whitewall less than an inch wide and is rated as a "premium tubeless tire with rayon cord."

* * *

National Highway Users Conference reports that during the fiscal year 1960, the Federal Government collected more than $4.3 billion in automotive excise taxes. Since 1932, when the present Federal excise taxes were imposed, highway users have paid in a staggering total of nearly $40 billion. Copies of this research report are available upon request to the National Highway Users Conference, National Press Building, Washington 4, D. C.

Engine Oil Leakage Through Distributor Housing Vent Holes

Dodge Division, Chrysler Corp. reports that in a few instances engine oil is leaking through the vent holes in the bottom of the distributor housing (6- or 8-cylinder distributors).

According to the factory, it is possible that this might be caused from the gear (or collar) retaining pin hole having been drilled through the spiral groove on the shaft. Installation of the pin could then destroy the purpose of the spiral groove.

The spiral groove must be open to wipe off any oil that seeps up between the lower bushing and the shaft. If oil is found to be leaking from the vent hole in the bottom of the housing, remove distributor from the car.

Remove the pin and gear (or collar) and inspect the shaft. If the pin hole has been drilled through the spiral groove, position the pin into the gear (or collar) and into the shaft just far enough to hold the location of the gear (or collar).

Drill a new hole 90° from the original hole and install the pin into the new hole.

"When I said 'Fill 'er up', I meant the gas tank!"

Plymouth Changes Distributor Specs

To improve both performance and economy on its 1960 and '61 cars equipped with the 224 cu.in. engine and automatic transmission, Plymouth recommends a distributor basic setting of 5°BTC. The basic setting for the 225 cu.in. engine equipped with a manual transmission remains at 2½°BTC.

Do you want to buy a business?
Use our Classified Columns—Page 64

Corrosion control in 1961 cars aids highway ice control practices

By Bernard P. Thomas, Director
Highway Materials Department
The Dow Chemical Company

• THE AUTOMOBILE INDUSTRY has taken the bull by the horns this year and made its greatest onslaught on the bugaboo of the aging car—corrosion.

For years, the brunt of attack for the perforated fender, the drooping headlight and the rusty bumper has been borne by various chemicals used in highway ice and dust control, commonly called "salt."

The popular term for these materials which have been developed by the chemical industry to provide safer and more comfortable driving has been "fender solvent." The fact that these chemicals prevented thousands of accidents on icy streets and highways and undoubtedly saved hundreds of lives received little recognition from the car owner who watched the demon corrosion day by day eating through the fenders of the motor vehicle. The National Association of Corrosion Engineers has estimated that corrosion costs the U.S. some seven billion dollars a year.

Intensive studies have shown that many factors cause corrosion of the family car: industrial fallout from the atmosphere, traffic film, tree sap falling on painted surfaces, high humidity, oxygen in the air, and, of course, the use of salts for dust and ice control.

ENGINE ACIDS MAIN ENEMY

The trailing tailpipe and muffler have been the symbol of corrosion expense, their replacement costing the nation an estimated $500 million a year.

Strange as it may seem, the actual cause of most muffler replacement is engine-emission acids which come from the engine and are more severe with stop-and-go driving.

"Compared with the damage which these acids can do, deterioration caused by road salt and moisture on the outer surface is negligible," Elmer W. Bernitt, vice president, automotive operations for American Motors Corp. has said.

American Motors met this problem head on with a new ceramic-coated muffler in the 1961 Rambler which is guaranteed for the life of the car while it is in the hands of the original owner. This could mean at least 50,000 miles or more of driving.

The aluminized muffler that is "double-wrapped for three times normal life" is provided by Ford Motor Co. in its 1961 models. Buick Motor Division of General Motors reports "heavy zinc and aluminum coatings of muffler parts promote long life" for its 1961 models.

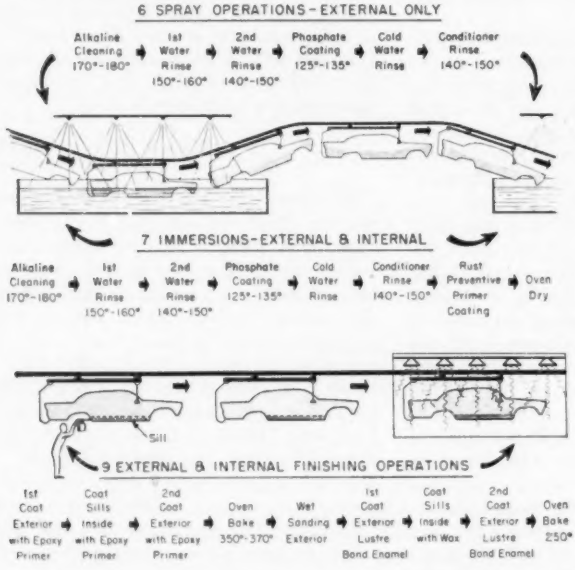
But the corrosion problem goes farther than mufflers. Body corrosion is more devastating and more expensive to replace. This is the area where the car manufacturers have picked up the ball and are running with it to the delight of all new car—and future old car—owners.

Three different approaches are being made by the automobile industry to control body corrosion. Ford Motor Co. is using galvanized steel sheet for rocker panels (sills) and underbody surfaces.

Chrysler Corp., American Motors and the Lincoln Division of Ford are dipping the body fully or part way in a special resin-base primer that flows into the interior areas where the spray gun cannot easily reach.

The third method is a zinc-rich paint which contains better than 85 per cent actual metal that is sprayed on and baked, leaving a rich surface coat of zinc. Chevrolet Division of General Motors is using this treatment.

Other techniques that are now used are these: use of special-coated steels for exposed body parts; heavy anodizing of aluminum body parts; galvanizing of underbody parts; improvement in chrome plating processes, such as double-plating with copper on front and rear bumpers, factory undercoating, to name a few.


6 SPRAY OPERATIONS - EXTERNAL ONLY
Alkaline Cleaning 170°-180°
1st Water Rinse 150°-160°
2nd Water Rinse 140°-150°
Phosphate Coating 125°-135°
Cold Water Rinse
Conditioner Rinse 140°-150°
7 IMMERSIONS - EXTERNAL & INTERNAL
Alkaline Cleaning 170°-180°
1st Water Rinse 150°-160°
2nd Water Rinse 140°-150°
Phosphate Coating 125°-135°
Cold Water Rinse
Conditioner Rinse 140°-150°
Rust Preventive Primer Coating
Oven Dry
Sill
9 EXTERNAL & INTERNAL FINISHING OPERATIONS
1st Coat Exterior with Epoxy Primer
Coat Sills Inside with Epoxy Primer
2nd Coat Exterior with Epoxy Primer
Oven Bake 350°-370°
Wet Sanding Exterior
1st Coat Exterior Lustre Bond Enamel
Coat Sills Inside with Wax
2nd Coat Exterior Lustre Bond Enamel
Oven Bake 250°

Illustrated is Chrysler Corporation's anti-corrosion system which includes advance preparation of the metal, six external spray operations, seven immersions and nine external and internal finishing operations.

UNIBODY CONSTRUCTION A HELP

The development of the unibody construction, which integrates the body and frame, has resulted in rustproofing and undercoating treatments that remove corrosion problems. The 1961 Dodge, for example, is treated with an "exclusive seven-step rustproofing process." Chrysler says further, "Our anti-corrosion protection embraces all corporation cars with six spray operations after metal preparation, seven immersions and nine external and internal finishing operations."

What about the painted surfaces of today's cars? Advances have been made here, too. From the days of the old carriage varnishes and enamels, which took days to dry, to today's acrylic finishes which dry in a few hours, coatings have become increasingly resistant to weathering and deterioration.

These super finishes are said to require only washing during the first 18 months. However, a car washed weekly during the winter to remove road grime will definitely have a longer-lasting and more lustrous finish, W. H. Coy, executive director of the Automatic Car Wash Association, maintains.

"The owner who has his car washed frequently—even every day—after exposure to road tar, salts, extrusions from insects and industrial contaminants in the air will get enough more on his trade-in to give him a 200 per cent return on his maintenance invest-

ment," Coy said.

TRIAL-AND-ERROR METHODS

The 1961 model cars are really the most corrosion-proof in the history of the automotive industry.

"Why hasn't this happened before?" The car owner may ask.

The story is one of great research and trial-and-error by the automobile industry and its supplying industries. New principles have replaced older applications. Some materials have been years evolving to their present state.

What does this mean to today's congested city and fast over-the-highway driving?

Highway engineers recognize the importance of freeing traffic as fast as possible from ice-storm tie-ups. It has been estimated in a metropolitan area, such as Detroit, that a delay of 30 minutes during rush hour traffic can mean the loss of a million dollars in wages alone, not to mention the loss in department store sales, and other factors.

Chemical de-icers are now used to remove the ice as quickly as possible. These are usually a mixture of salts —calcium chloride and/or rock salt. Abrasives are used to provide traction for the motorist at crossings.

WINTER MAINTENANCE VARYS

The usual procedure is to go first with the snow plow as the storm develops. If the temperature is dropping, the highway department will use chemical de-icers. If the temperature is 20°F. and rising, rock salt will generally be used. If it is below 20°F. calcium chloride or a mixture of calcium chloride and salt is desirable. The ratio will vary with the anticipated temperature. Chemicals are also mixed with abrasives, such as sand, to keep them from freezing while in stockpile.

Winter maintenance will vary over the country. Generally, with the heavy cross-country traffic, highways must be opened immediately. The need to find materials that will penetrate heavy ice rapidly to meet a wide range of driving conditions has required constant research by highway maintenance materials laboratories.

Now that the automotive industry has tucked the corrosion control problem under its belt, highway engineers can move less gingerly in their winter safety-control practices to protect the 70 million plus cars now on the road.

Estimates place the total passenger car mileage of the nation for 1959 at 670 billion miles. It is estimated that by 1975, total passenger car mileage will have zoomed to more than a trillion miles.

In view of such astronomical traffic figures, the answer to the present-day corrosion and highway safety problems cannot come a year too soon.

'61 Lube Practice . . . *(Continued from page 29)*

fitting are as follows: Upper ball joints—two lubricant fittings, one on each upper ball joint; lower ball joints—two lubricant fittings, one on each lower ball joint; tie-rod ball ends—four lubricant fittings, two on each tie rod. With the manual transmission, there is a lubricant fitting on the clutch torque shaft and also on the gearshift tube and lower support assembly. These all take standard chassis lubricant. On the steering gears, both manual and power, there are special instructions which should be taken from the manual. This also applies, as usual, to differentials and rear axle gears.

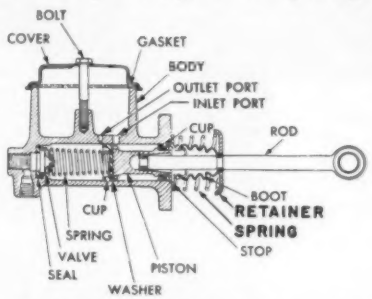
AMERICAN MOTORS, STUDEBAKER STAND PAT

As far as American Motors is concerned, no changes have been made in its recommendations on oil changes or grease jobs. Following previous practice, a recommendation of 2,000 miles between oil changes and 1,000 miles between each greasing is continued.

Studebaker likewise has not changed its practice and recommends chassis lubrication every month or 1,000 miles. Chassis lubrication points on the Studebaker cars include two fittings on each arm requiring chassis lubricant. Other fittings are one on the steering knuckle, one on the steering bell crankshaft, four fittings on the steering tie rod ball joints and two fittings on the steering reach rod. On the Hawk models, there is an oil fitting on the clutch and brake pedals which require chassis lubricant. There is also a fitting on the clutch release shaft. Information on other points requiring other than chassis lubricant and at varying mileage, as on all cars, should be taken from the manuals or lubrication charts. The points mentioned are for the 1,000-mile chassis lubricant schedule.

Increasing Brake Pedal Height and Providing Faster Pedal Return

Chrysler Corp. has released for service on its 1960 Chryslers (without power brakes) a new ⅛" longer master cylinder push rod package (Part No. 2240245) for increasing pedal height approximately one inch, and a pedal return spring (Part No. 2260710) and return spring seat (Part No. 2260709) designed to provide quicker return of the brake pedal.



To install the spring and retainer, disconnect the master cylinder push rod at the pedal and install the return spring over the master cylinder boot. Install the return spring retainer at the rear end of the return spring, engaging the retainer in the boot groove on the push rod. Connect the push rod to the pedal, being sure to lock the push rod pin.

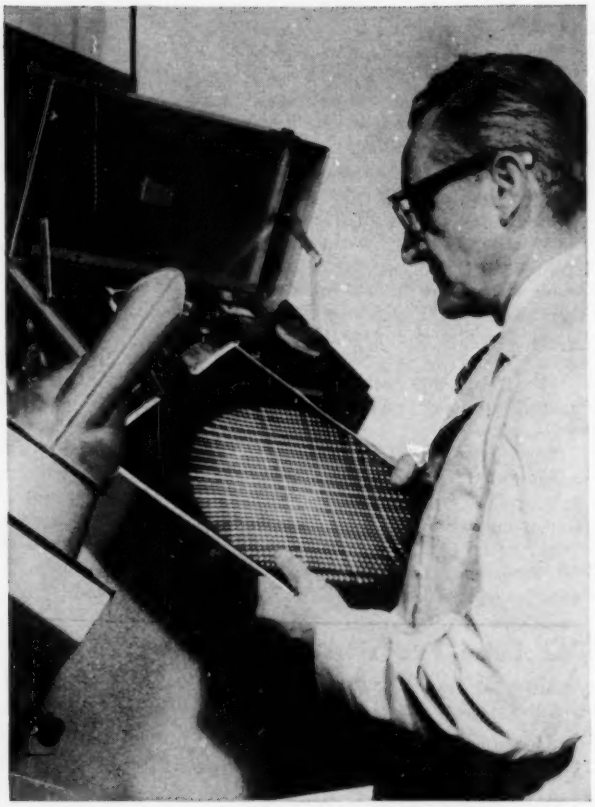
After the return spring is installed, *do not install any additional springs* to pull the pedal back, since additional spring tension may pull the push rod from the master cylinder piston.

Overcoming Rear Axle Lubricant Seepage

A service bulletin applying to all 1960 Chrysler models points out that should a mechanic experience a condition of rear axle lubricant seepage at the rear axle housing vent screw, located on top left side of the housing near the banjo, after sustained high speed operation, this condition may be brought about by expansion of air within the housing as the unit gets to normal operating temperature. Lubricant which has accumulated on the small opening at the bottom of the vent may be forced up and out of the vent cover.

To correct this condition the inside diameter of the vent should be increased to 9/32", approximately 1" deep, and a 45° chamfer should be added on the threaded end, to prevent the lubricant from accumulating on the bottom of the vent screw.

A huge log proves no obstacle to this amphibious "Go-Devil," made by Wagner Tractor, Portland, Ore. Each of the wheels, equipped with Goodyear All-Weather tractor tires, is mounted on a leg which can be vertically orbited a full 360°. With them, the operator can make the machine step over obstacles. The machine can climb up on banks seven feet high, wade in shallow streams and cruise in deep water with the aid of a propeller in the rear.



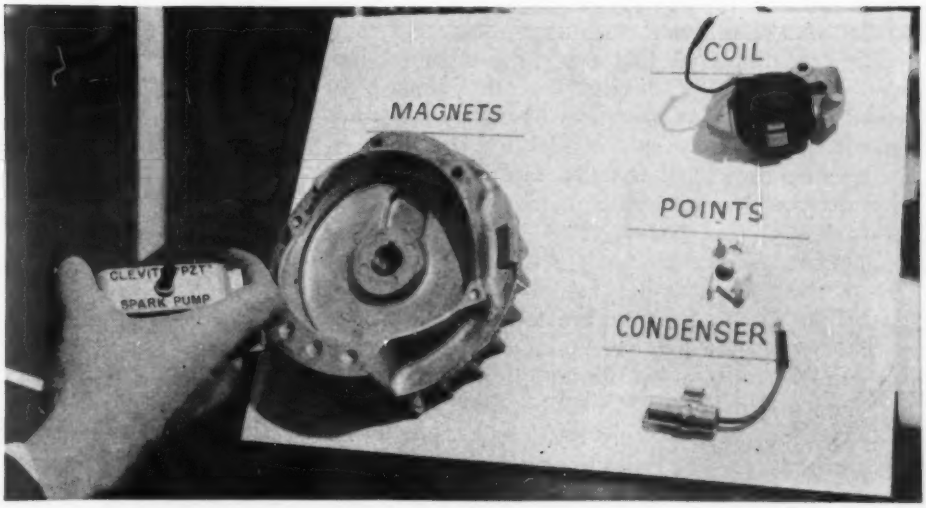
Tire research engineer of United States Rubber Co. examines steel cord structure of a truck tire, revealed by a fluoroscope. Print of fluoroscopic picture is visible through the eyepiece (left) of the new instrument. Use of the image amplifier fluoroscope in the rubber industry, to study tires before and after vulcanization, is expected to lead to development of better tires and more advanced manufacturing methods.

This sign, which is a reproduction of the IGO "Signs of Progress" highway sign, was presented to IGO-St. Louis by Moog Industries, Inc., one of its allied manufacturing members. Standing in front of it are: (left to right) H. C. Moog, President, Moog Industries, Inc.; Art Kittell, President of IGOA; Ralph H. James, National Director of IGOA and J. B. Bushyhead, Executive Vice President, Moog Industries, Inc.

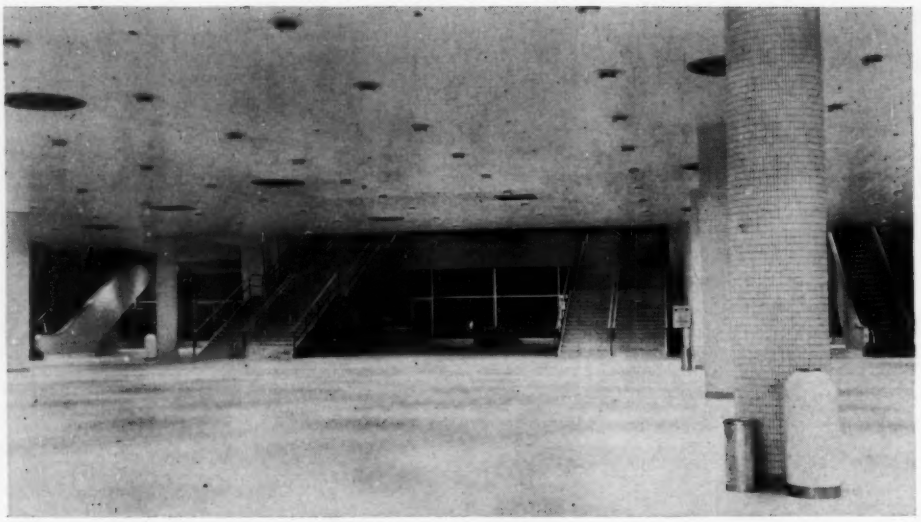
PHOTOS
from here and there

A Chrysler-Perkins diesel engine installed in a Checker Cab. It is said that this fleet of seventeen cabs (1959 Plymouths) reduced average fuel consumption to 20.3 m.p.g. as compared with about 10 m.p.g. for a gasoline powered vehicle. Inability to "jack rabbit" diesel cabs from traffic lights pays off, too, in fuel and maintenance costs.

A workman at The Budd Company plant in Detroit makes some small adjustments on the all-stainless steel bodied Thunderbird, made for Allegheny Ludlum Steel Corp., and which will be featured in the Sealed Power Corp. booth at the coming ASIS in Los Angeles. The steel firm supplied the stainless for the car and the Ford Motor Co. added the additional equipment on their Thunderbird assembly line. The special body is expected to last indefinitely.



An ignition system smaller than a man's fist replaces coil, points, condenser and magneto in a new engine introduced by Clinton Engines Corp. Shown in the hand at left is the Spark Pump made by the Clevite Corp. and its location under the flywheel, upper center, in Clinton's new engine. The new ignition device generates a constant 20,000 volt charge from a tiny artificial crystal —a ceramic—by a phenomenon known as piezoelectricity, defined as "electricity or electric polarity due to pressure."



A view in the spacious lower level of McCormick Place, Chicago's newest lake front exposition center.

New home for Chicago's 53rd show

McCormick Place, with over 300,000 sq.ft. of space, will house in one display area most complete showing of U.S. and foreign cars, accessories and special displays. Adheres to original theme "The CAR is the STAR."

• IN 1961 AS IN 1901, the Chicago Automobile Show, Feb. 18 through 26, will have one purpose: Introduce the new cars to as many thousands of people as possible through display of all makes side-by-side for examination and comparison.

The policy today varies only slightly from that of the first show, March 23-31, 1901. Then, the strange new horseless carriages were a novelty and folks had to be persuaded they were safe as well as a practical and timesaving form of transportation. Now, it's a matter of showing the various new models to best advantage in a setting that is a spectacular crowdstopper.

The few thousands that saw the first show were mainly curious. The hundreds of thousands who attend annually in recent years obviously are more knowledgeable about automobiles and they're present because they have come to accept the Chicago show as the one place where they can look and compare.

Chicago Automobile Trade Association sponsorship of the show that began in 1935 is in a direct line of succession back to the late Samuel Miles, who promoted the inaugural in 1901. In 1902, the National Association of Automobile Manufacturers and the Chicago Automobile Club joined with Miles and two years later, the newly formed C. A. T. A. became part of the cooperative picture.

When Miles died in 1934, the C. A. T. A. assumed outright sponsorship and in 1935, presented one show in February and another the following autumn. Except for the 1941-1949 period, the dealers' organization has held a show annually since.

The ultimate in exposition facilities is provided at McCormick Place, the $35,000,000 new home of the 53rd annual Chicago show. The vast new exposition center is at 23rd Place on the lake front, easily accessible by all forms of transportation.

The main exhibit area, where the more than 400 passenger cars and trucks will be displayed, will be approximately the size of six football fields with

Exterior of the exposition center's main theatre which has two levels and over 5,000 seats. The stage is 175 ft. wide and 60 ft. deep.

over 300,000 square feet of usable floor space. The entire structure is a block wide and three blocks long, 365 by 1,180 feet, and covers nearly ten acres on a plot of 30½ acres.

Minimum ceiling height of the main exhibit area is 30 ft. and the floor is 42 ft. above Lake Michigan. The level beneath this area is devoted to meeting rooms, a glass walled restaurant looking out on Lake Michigan and Burnham Park lagoon, a cafeteria with a capacity of 1,800 meals an hour, an art gallery and a little theatre or recital hall with a capacity of more than 500.

At the south end of the exhibit area is a 5,000-seat theatre with a stage 60 ft. deep and a proscenium arch 90 ft. wide and 38 ft. high. Every seat on the two levels has an unobstructed, undistorted sight

Among the features of McCormick Place are restaurants, an art gallery and shops, the one shown being typical.

line to the stage and the acoustic properties are as nearly perfect as sound engineers can make them. Parking is available for 10,000 cars.

The consistently high level of attendance annually is unmatched in the field of automotive expositions. In eleven years since the show was resumed in 1950, aggregate attendance has been 5,346,446—and surveys prove these are not casual amusement seekers but rather are automobile-minded people. It is a selling show with emphasis on the theme that the CAR is the STAR, presented in a glamorous setting. Unique in the area of shows of this nature, the Chicago event is a striking contrast. Unlike many other shows, where the attendance curve descends after a big opener, the Chicago exposition maintains a constant level and closing weekend crowds invariably match the start.

As in the past, this is the largest, most complete automotive showing in North America, with more than 400 domestic passenger cars and trucks and foreign cars, as well as over fifty parts, accessories and special displays.

Domestic cars include Buick, Buick Special, Cadillac, Checker, Chevrolet, Corvair, Chrysler, Valiant, Dodge, Lancer, Ford, Falcon, Imperial, Lincoln, Mercury, Comet, Oldsmobile, Oldsmobile F-85, Plymouth, Pontiac, Tempest, Rambler American, Studebaker Hawk and Studebaker Lark.

The following foreign cars will be shown: Arnolt-Bristol, Austin, Austin-Healy, Citroen, DKW, English Ford, Fiat, Hillman, Humber, Jaguar, Mercedes-Benz, Metropolitan, MG, Mini Minor, Morris, Opel, Peugeot, Renault, Riley, Saab, Simca, Singer, Sunbeam, Toyota and Triumph.

Trucks include Chevrolet, Dodge, Ford, International Harvester, Studebaker and Willys.

Be Careful When Checking 12-Volt Batteries with Voltmeter

Many 12-volt batteries incorporating hidden cell connectors are manufactured with complex cell arrangements, making it difficult to locate the connectors for an open circuit test with a voltmeter.

When using a voltmeter for such a test, be sure you know the exact location of the proper cell connectors, otherwise you may ruin the voltmeter if it accidentally contacts two or more cells during the test. Also, don't forget to reseal the compound over the connectors after having finished with the test.

Heat Riser Lube Interval Increased

Ford Motor Co. has recommended that the exhaust control valve be lubricated at every 1,000 miles. This supersedes their former recommendation of every 6,000 miles.

A mixture of penetrating oil and graphite, or door lock lubricant, will prevent the shaft from binding.

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These are new *manufacturers' products*

HOW TO GET RUSH INFORMATION

If you want further information or literature describing the products shown in our "These Are New" pages, just use the handy Business Reply Card you'll find further back in this issue. Whether you want information on one or more of the products, all that is necessary is to mail this Postage paid card properly filled out to AUTOMOTIVE SERVICE DIGEST. Our Reader's Service Dept. will contact the manufacturers directly and see that you obtain the requested information as quickly as possible.

Portable Brake Service Shop

The Barrett B-6A Universal Portable Brake Service Shop is designed to expand service department facilities with up-to-date equipment without tieing up valuable shop space needed for other services. It is equipped with the improved Drum-Dokter

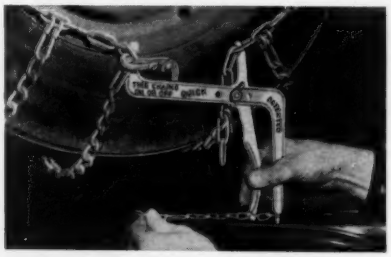
brake drum lathe and B-75BD True-Arc brake shoe grinder for precision, trouble-free drum machining and shoe fitting . . . plus equipment and tools necessary for passenger car and light truck service. The unit has large front wheels and rear caster for easy movement to the job indoors or outdoors.

(Circle No. 1 on Reader Service Card)

Tire Chain Tool

The Easy Tire Chain Tool, recently announced by Autocraft Products, is specifically designed to make installation and removal of tire chains simple, regardless of chain size or design.

According to the manufacturer, chain installation is simplified to five quick, easy steps: (1) Chains are draped over tire and hooked on the inside. (2) First link of the outside chain is hooked by the Easy Tire Chain Tool. (3) Tool lugs are inserted into the chain links easily, regardless of size. (4) Handles of the tool are



squeezed together and the attached tool chain is hooked over the inside handle to lock the tool and tire chains in position. (5) Having both hands free and the tire chain held firmly in place, it is then said to be an easy matter to lock or unlock the tire chain clasp.

(Circle No. 2 on Reader Service Card)

Tire Spreader

A lightweight, compact passenger car tire spreader has been added to the line of tire changing equipment produced by May Brothers Mfg. Co.

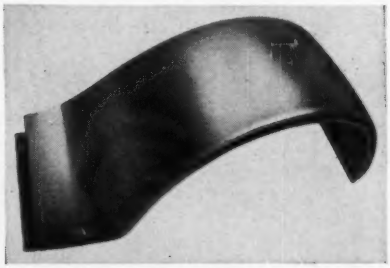
Called the Model 101, the low-cost unit fits conveniently on top of all May Model 62 and 58 Series tire changers. The new tire spreader easily

handles all passenger car and light truck tires, giving a wide inner bulge for easy inspection and repair. The curved jaw clamps are also said to prevent tire bead damage.

(Circle No. 3 on Reader Service Card)

Head-Lite Replacement Panel

Answering a common body repair problem, the Schofield Mfg. Co. is offering a Sco-Pan die formed Head-Lite panel for 1955 Chevrolets.



The manufacturer states that the replacement panels are exact, precision die-formed facsimilies of the parts they replace, produce a perfect repair, save hours of work and increase body shop profits. This new panel is just one of more than 600 other autobody replacement panels offered by Schofield.

(Circle No. 4 on Reader Service Card)

Torsion Bars

Premium quality torsion bars by Toledo Steel Products are preset for right-hand and left-hand applications to increase torsional strength up to 35 per cent. Each bar is made of the highest grade chrome-manganese steel—

scientifically heat treated, shot-peened, preset, Magnafluxed and enameled to resist corrosion.

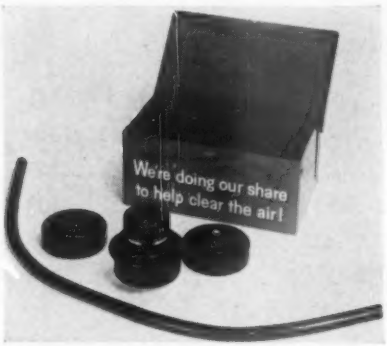
Anchor bolt and swivel assemblies are also supplied by "Toledo", as are rear anchor seal kits. The bolt and swivel assembly provides a free-turning adjusting mechanism to aid front end height adjustment. The seal kit keeps surface corroding road materials away from the rear anchor portion of the torsion bar—thus increasing torsion bar life.

(Circle No. 5 on Reader Service Card)

Crankcase Ventilator Tester

A new test device for checking all positive crankcase ventilation systems that use the AC-type valve has been announced by AC Spark Plug Division of General Motors.

The tester is easy to operate and requires only one connection—the insertion of a rubber test adapter plug into



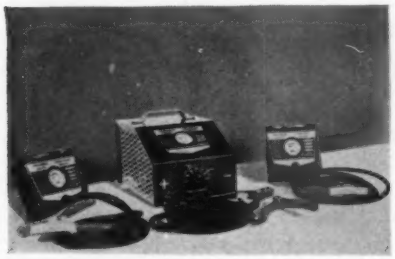
the oil filler or breather cap opening. It checks crankcase ventilation by measuring air circulation through the system at engine idle.

Condition of the system is revealed by color coding visible through windows in the tester. A selector knob on the bottom of the tester permits calibration to match air flow rates for the system being tested. The tester will show green, yellow, a combination of yellow and green, a combination of red and yellow, or red. Green means the system is satisfactory with sufficient air flow through the ventilation valve. Yellow means no circulation at all, with the valve partially plugged and blow-by close to the capacity of the valve. Red means reverse air flow, caused by a plugged valve, a valve stuck in the "engine off" position, or extreme engine blow-by.

(Circle No. 6 on Reader Service Card)

Battery Chargers

The Twentieth Century Mfg. Co. recently developed a new, low-cost self contained battery charger, and two new plug-in chargers designed to operate off electric welders.



The new self contained, 110-volt charger (center of illustration) comes complete with 10 ft. battery cable and insulated clamps for "quick" or "trickle" charging 6, 8 or 12 volt batteries. Features of the unit include two silicon rectifiers with two automatic circuit breakers to prevent damage to the unit or to batteries from external short circuits or wrong connections; light-weight for easy portability; rugged steel case with baked enamel finish and man sized handle and grips.

The two charger attachments for welders are similar to the above unit in that they charge 50 amps at 6 volts or 30 amps at 8 or 12 volts, but the Model 140-4 will also charge 24 volts at 20 amps to permit the charging of diesel batteries. Both attachment models can be used for quick or trickle charging, and can be used with all Twentieth Century welders and most other similar welders.

(Circle No. 7 on Reader Service Card)

SpeedGun Air Hammers

Two new SpeedGun air hammers, specifically styled for automotive muffler, body and frame work involving cutting, slitting, ripping, scraping, shearing or punching, have been announced by Thor Power Tool Co. Both air hammers are available in kits with chisels and other attachments necessary for handling these jobs.

One is a short-stroke, heavy-duty model. It weighs only 2½ lbs., is 5-1/16″ long, and operates at 5500 blows per minute. The other is a long-stroke, extra heavy-duty model, which weighs only 3 lbs., 6 oz., is 7⅛″ long, and delivers 3360 blows per minute. Both consume 13 cfm of air and have 0.401″ chisel shank diameter. Hose thread for both is ¼″ pipe thread and recommended hose is 5/16″.

(Circle No. 8 on Reader Service Card)

Rebuilt Starters for Falcons

Arrow Armatures Company announces the availability of factory rebuilt starters for all models of the Ford Falcon. Each starter is an exact duplicate of the original equipment.

The armature is completely reconditioned, varnish impregnated and baked, and field coils are new or newly rewound. Bushing bearings, oil wick insulators and brushes are all new.

Arrow's complete line of factory rebuilt starters contains replacements for almost every passenger car, taxi and light truck, including late model American and foreign cars.

(Circle No. 9 on Reader Service Card)

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• ONLY ASD provides the automotive service field with timely, authoritative, detailed articles of this type. Prepared by men who have the actual experience, as well as the education to "live with" the increasingly specialized service needs of the modern automobile, these features go deeply into the methods and mechanical parts involved. Most "Tech Know-How" write-ups are step-by-step "how-to" descriptions of the latest procedures in a key servicing operation.

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THROUGH THE PAGES OF ASD . . .

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You need ASD to keep fully informed —and get your fair share of the benefits from technical advances. USE THE CONVENIENT POSTPAID CARD ABOVE TO ENTER OR EXTEND YOUR SUBSCRIPTION—TODAY.

Steam Cleaner

Choldun Mfg. Corp's new "Iron Horse" steam cleaner has a specially designed dual-piston water pump which is said to (a) deliver full volume of water at all times regardless of operating pressure, and (b) be practically indestructible because it

cannot be harmed by hard water, lime, rust scale or any kind of chemical, including powder.

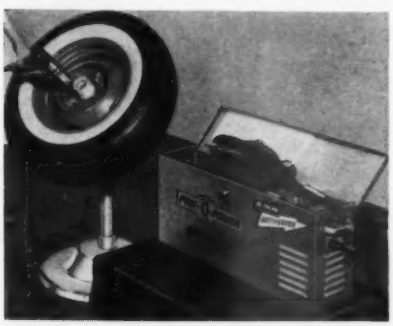
According to the manufacturer, the efficiency of a steam cleaner depends upon its output, and it is important that this water output does not increase or decrease with pressure. As an example, the manufacturer states that if a steam cleaner is rated 100 gallons per hour—it should deliver 100 gallons per hour at all pressures. In other words, regardless of pressure, the volume of water does not decrease.

Choldun steam cleaners are claimed to have nine exclusive features . . . they come in three models, with capacities of 60, 100 and 120 g.p.h.

(Circle No. 10 on Reader Service Card)

Portable 110-volt Pack-O-Power

With the ESB Activerter, recently announced by The Electric Storage Battery Co., it is possible to provide 110-volt alternating current any place



a 12-volt battery is available or can be taken for the operation of general service tools for roadside repairs, impact wrenches, emergency lighting and a wide range of other applications. In addition, the flick of a switch converts the Activerter into a fast or slow charger for 6- and 12-volt batteries.

The unit is available in four models with capacities from 150 to 500 Watts —the 500 Watt Pak-O-Power model being a multi-service portable unit, with self-contained 12-volt battery, inverter, charger and car-start leads.

(Circle No. 11 on Reader Service Card)

Trailer for Compact Cars

American Trailer & Mfg. Co. announces the "mighty midget" compact car utility trailer scaled in size to ride perfectly level with small cars of all types. The trailer measures 42" x 72" x 12" deep and features all-welded steel construction for "long haul" performance. Load capacity is 1500 lbs. due to leaf-spring suspension. The leaf

springs, plus 8" demountable wheels riding on Timken roller bearings, and the 5.70: 500x8 tires, offer both smooth, easy ride and exceptional load capacity.

A ball-and-socket hitch, drop tail gate, safety chain, fenders, and dual tail lights and stop lights and directional signals are furnished.

(Circle No. 12 on Reader Service Card)

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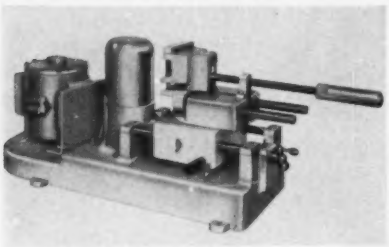
These are new *manufacturers' products*

Brake Shoe Grinder

A new Model 850 brake shoe grinder, recently introduced by Star Machine & Tool Co., is said to assure precision-fit brake shoes every time to

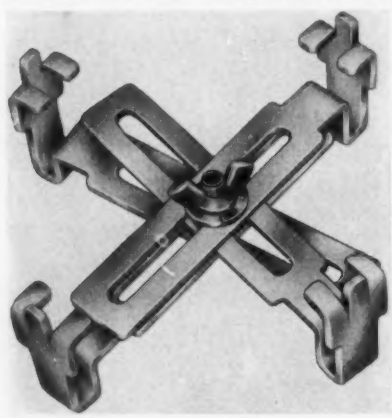


exact drum diameters. The new patented linear motion bearings make all carriage and shoe holder adjustments effortless . . . requires no lubrication . . . assures lifetime precision alignment. Carriage and shoe holder assemblies travel on hardened and ground ways and the new design lever action shoe holder provides instant clamping and removal of brake shoes.

(Circle No. 13 on Reader Service Card)

Carburetor Repair Stand

The Universal Carburetor Repair Stand recently announced by The Borroughs Tool and Equipment Corp. holds a carburetor firmly in such manner that it may be set on a bench for most convenient adjusting or re-



pairing. Both hands are free to work, and all linkage is free to operate without drag or interference.

The device consists primarily of two steel cross-arms held together at the center with a bolt and wing nut for adjustment. Each arm is in two parts, each part slotted and sliding over the companion part, so as to extend its length from 1¼" to 9½". The four outer ends of the cross bars are equipped with suitable lugs to engage the carburetor wherever most convenient. The outer ends also have legs to stand on the bench. With the liberal diameter adjustment permitted, and the swing of each arm on itself or all together, any carburetor (one, two or four barrel type) may be instantly secured for repairing.

(Circle No. 14 on Reader Service Card)

Universal Coils by Autolite

The Electric Autolite Co. is now marketing a new Universal Coil package that covers more than 1,500 different applications on today's cars, trucks, farm tractors, combines, marine and industrial applications. The

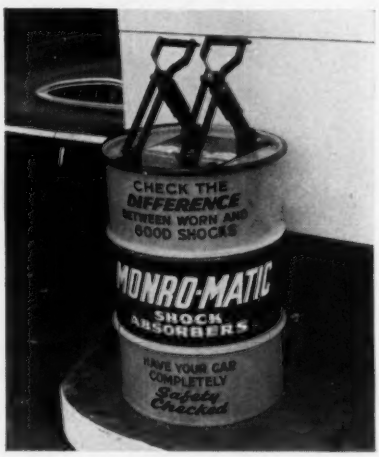
four coil package contains three non-ballast type universal coils (two 6-volt and one 12-volt) and one universal 12-volt ballast type coil. According to Autolite, the new coils provide lower operating temperatures contributing to quick starts and peak performance. Each coil is hermetically sealed in a seamless container thus offering greater resistance to moisture and is oil-filled under vacuum and pressure.

(Circle No. 15 on Reader Service Card)

Shock Absorber Demonstrator

A barrel of shock absorbers, with a tester to help sell them, is the latest sales help being offered dealers by Monroe Auto Equipment Co. The brightly painted barrel (actually a steel drum) has on the lid a comparison shock absorber tester which permits a customer to find out for himself the difference in action between a good shock absorber and a worn-out one.

The barrel is being offered dealers as a package which includes seven pairs of the most popular shock absorbers and two pairs of Load-Levelers, the company's stabilizing device for rear suspensions. The tester is attached to the lid and inverted when



the drum is closed for shipment. It is simply turned over and mounted on the blue-and-yellow painted drum for display purposes.

(Circle No. 16 on Reader Service Card)

"Add-A-Drawer" Storage Units

Open storage space at the bottom of two models of Huot mobile tool cabinets can now be converted to enclosed additional drawer space by insertion of new "Add-A-Drawer" units. The new units require no nuts, bolts, screws or drill holes . . . they are installed merely by sliding them

into place, where they become firmly seated between the oversize full-length corner posts.

Users of Huot's No. 201 mobile tool cabinet (left) can put two extra drawers in the open storage space, each 4" deep vertically, 16" front to back, and 21½" side to side. One large 5" deep drawer is available for the No. 250 mobile tool cabinet (right). Horizontal dimensions are 16" front to back and 21½" side to side.

The drawer units are finished in the same hard baked steel grey or or red enamel as original equipment drawers. The enamel is chip-resistant and greaseproof.

(Circle No. 17 on Reader Service Card)

Looking for a Job? Use our Classified Columns—Page 64

Engine Testing Laboratory

The Master Analyzer, recently announced by Snap-on Tools Corp., combines five precision testing components in cast aluminum and sheet steel console. Units included are the MT-615A Anal-O-Scope, the MT-430 Igni-

tion Analyzer, the MT-401B Generator-Regulator Tester, the MT-415B Tach-Dwell Meter, and the MT-425 Vacuum and Fuel Pump Pressure Gauge—a combination of engine testing equipment which the manufacturer states is designed to provide faster, more efficient and more accurate work, resulting in greater customer satisfaction.

Any component may be removed from the console if desired. Three compartments are provided for storage of the meter leads when not in use. A specially designed Roll-Cab is also available for use with this unit to provide a completely portable laboratory.

(Circle No. 18 on Reader Service Card)

Quick Drying Sealer

A liquid sealer that can be painted 30 minutes after application has been announced by Minnesota Mining and Manufacturing Co.

Its rubber base makes "3M" brand

"Drip-Chek" sealer set rapidly, compared with drying time of several hours to several days for oil base sealers. Unlike other sealers, the new product is said to resist oil, gasoline and grease, as well as water, and will remain flexible for years.

"Drip-Chek" sealer smooths itself. It flows slightly to seal cracks or openings on welded seams, drip rails, mouldings and firewalls.

It is available in five ounce tubes and seven and one-half ounce and pint cans. The cans fit "3M" brand applicator guns which can be used with flow or spreader tips.

(Circle No. 19 on Reader Service Card)

Fender Protectors

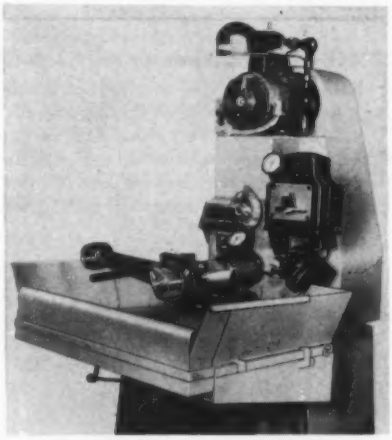
A new Protect-O-Mat fender cover is announced by H. B. Egan Manufacturing Co. The cover is 40" x 26", and

it is durable sponge rubber bound with vinyl. Its substantial thickness is said to prevent scratches and dents and keep grease, grime and acid away, while the rubber backing prevents slipping.

(Circle No. 20 on Reader Service Card)

Rod and Pin Honing Machine

A new honing machine for rod reconditioning and pin fitting is announced by Sunnen Products Co. The new machine is said to have a wider selection of speeds, as well as greater pulling power of the spindle—features



that will accommodate the fast growing rod reconditioning market in the larger truck and diesel rod field, as well as passenger car rods.

Among the new features are a V-belt double reduction spindle drive and six speeds from 200 to 640 rpm.

(Circle No. 21 on Reader Service Card)

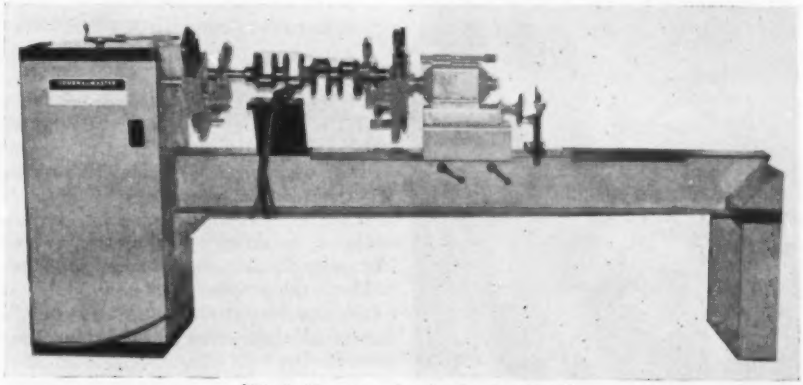
Gasoline Filters

Walker Manufacturing Co. now offers a complete line of gasoline filters for fuel pumps, sediment bowls and in-line installations, designed to filter out dirt invisible to the naked eye. The new filters, with exclusive pleated Duocron material, are said to eliminate dirt and abrasives down to 10 microns in size to overcome complaints of bucking, flooding, stalling and costly carburetor repairs.

(Circle No. 22 on Reader Service Card)

Storm-Vulcan Journalmaster

The Model 130 Journalmaster, recently announced by Storm-Vulcan, is said to be the answer for rotating crankshafts while building up journals. The unit has a vari-drive motor to permit rotation of shafts from 1 to 40 rpm, and is said to assure proper alignment of the crankshaft, thus cutting down on costly grinding time. The machine is properly shielded for Metalizing process and properly grounded for Welding process. It is available in three bed sizes—66", 84" or 96" between centers; a swing of 22" and stroke of 10½".

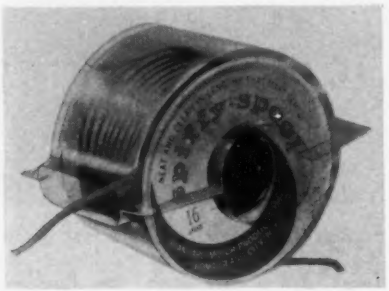


(Circle No. 23 on Reader Service Card)

These are new *manufacturers' products*

Plastic Wire Dispenser

An entirely new method of packaging wire called the "Spiffy Spool" by its manufacturer, Standard Motor Products, Inc., enables the mechanic to buy spooled wire in convenient, less-than-100-foot lengths and gives



him a dispenser package that keeps the wire neat, clean and visible.

Standard encloses each Spiffy Spool in a rigid plastic "bubble" which allows the mechanic to reel off any desired length but keeps the remainder from unravelling. In addition, the dispenser keeps off dirt and grime and, because it is made of clear plastic, allows the contents to be seen.

Spiffy Spools are available in wire gauges from 18 to 10. A special number containing 15 ft. of 7 mm cable is made for ignition wiring jobs. All popular insulation colors are available in each gauge.

(Circle No. 24 on Reader Service Card)

Remote Starter Switch

A remote starter switch, recently announced by Kal-Equip Company, features a handy built-in light bulb which puts a trouble light at the mechanic's finger tips, making it ideal for tight jobs like working on distributor points.

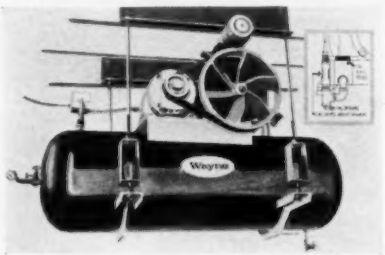
The remote starter switch is guaranteed to handle even the big ones. The contacts are extra heavy and double silver plated for extra reliability. It comes supplied with heavy-duty connecting leads to further insure trouble-free operation.

(Circle No. 25 on Reader Service Card)

Ceiling Suspended Compressors

Two new air compressor models by The Wayne Pump Co. utilize a specially designed ceiling suspension system to eliminate floor space consumption.

The compressors are two stage units having displacements of 9.5 and 14.0



CFM respectively. Each is supplied with an 80 gal. tank. Wayne states that ceiling suspension permits the relatively large tanks which might otherwise be impossible in limited floor space conditions.

The entire assembly consists of a complete suspension kit with structural angles, hanger rods, vibro-hangers and hardware, the compressor and the tank with suspension cradles. A pressure gauge, manual shutoff valves and connecting outlets are also provided so that the assembly will be operational as soon as it is installed. Either model can be supplied with single phase or three phase motors.

(Circle No. 26 on Reader Service Card)

Carburetor Tune-Up Kit

A new carburetor tune-up kit—the Pacco Plus Kit—is announced by Precision Automotive Components Co., which includes a plastic needle tip said to assure tight seating at all times, even when fuel is contaminated by iron oxide.

"No longer will mechanics have to buy a separate plastic tip," states Murray Ferber, Pacco sales manager. "Everything they need is available in this one kit—including Pacco needle and seat assemblies and the new Viton needle tip."

(Circle No. 27 on Reader Service Card)

Pellet-Type Thermostats

A new line of original-equipment-design thermostats has been announced by Sterling Automotive Mfg. Co. To be marketed through volume

users under the company's Stamco brand, the new pellet-type line gives complete coverage of domestic and foreign cars with just five thermostats.

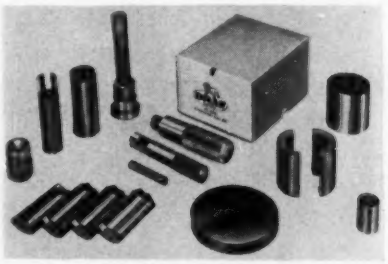
Features include full-flow butterfly valve, recessed design which places the thermostat's pellet entirely on the engine side of the thermostat, and dual stainless steel tension springs to balance the valve-opening force of the pellet.

(Circle No. 28 on Reader Service Card)

Alternator Service Tools

Specialized tools for servicing alternators used on Chrysler products, as well as Autolite Alternators, are now available from the Draf Tool Co. The tools are available as individual units or in three different service kits.

The master kit (VA-600) comprises



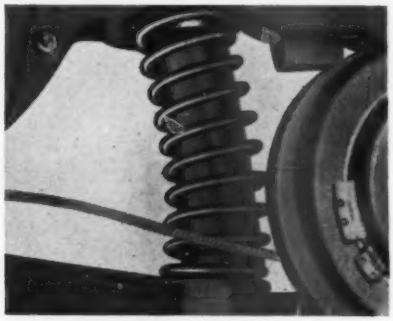
a complete set of ten tools. The VA-601 tool kit is made of nine tools and the VA-602 tool kit comprises eight different tools.

All Draf Alternator Tool Kits come with an illustrated service manual which covers alternator assembly and disassembly, bench tests as well as in-the-car tests. Alternator diagnosis problems are also covered in the service manual.

(Circle No. 29 on Reader Service Card)

Air Lift Air Springs

A new line of air lift air springs designed for easy and trouble-free installation inside the rear coil springs of the Olds F-85, Buick Specials and any Rambler models except Americans, is announced by the Air Lift Co. Units are also available equipped with their own coil springs for instal-



lation between the leaf spring and frame on Falcons, Valiants, Comets, Larks, Lancers and Rambler Americans.

When inflated with air, the new Air Lift Air Springs raise the rear of the car in direct ratio to the amount of air pressure applied to provide a smooth, safe and level ride under any load or road condition, according to the manufacturer. The air pressure can be adjusted to maintain perfect balance under varying loads, as well.

(Circle No. 30 on Reader Service Card)

Ignition Cable Tester

A portable ignition cable resistance tester, which gives direct-reading measurements of automotive ignition lead condition without mathematical calculations or reference to complicated conversion tables, is announced by M.P.S. Electronics.

Housed in a sturdy 6" x 4" Bakelite case, complete with 9-volt transistor type battery, the tester, according to the company, makes possible for the first time instant checks of resistance cable, resistor spark plugs and suppressors. The unit is factory-calibrated

for all makes and models of U.S. passenger cars and trucks built since 1955.

By using the tester, it is reported, ignition cable troubles can be pinpointed quickly and accurately, so that faulty cables can be located and replaced individually, rather than replacing the entire ignition cable harness.

The tester also functions as a continuity checker, swiftly locating fuse, lamp and radio tube burnouts and open circuits.

(Circle No. 31 on Reader Serivce Card)

Screw-Type Swaging Tool

A new screw-type swaging tool—for use on larger aluminum, brass and copper tubing where "sweat-type" fit-

tings are needed—is being offered by Imperial-Eastman Corp.

Because of its small size, the tool can be operated in even the closest quarters where it's often impossible to use a conventional punch-type tool because of obstructions or limited space. The tool swages all four of the larger plumbing sizes—⅝, ¾, ⅞ and 1⅛ in. O.D. It will also enlarge the inside diameter of one piece of tubing to permit entrance of another piece which can then be soldered in place.

The yoke is made of rugged forged steel and has the latest slip-on feature. Once clamp and yoke are in place there's no guess-work in lining up the tube. A tough chrome-plated plunger centers itself over the tube, right where you want it.

Changing adaptors is easy, too. Just unscrew the holder, lift out the plunger and drop in another. You need only draw the holding ring finger tight and you're ready to work on a new size.

(Circle No. 32 on Reader Service Card)

Cold Weather Plastic Tape

A new pressure-sensitive, plastic tape for electrical wire splicing which will remain flexible at temperatures as low as —50° has been developed by Permacel. Designated Permacel 295,

the black plastic tape has an overall thickness of 8.5 mills with excellent tensile strength, 135% elongation, outstanding dielectric strength and insulation resistance, as well as high adhesion. The tape will conform snugly to irregular surfaces, assuring a tight bond with minimum of tape build-up.

Although designed for cold weather usage, it will perform equally well in moderate temperatures and remains serviceable under operating temperatures up to +180°F.

(Circle No. 33 on Reader Service Card)

"On-The-Floor" Wheel Aligner

A new "on-the-floor" wheel alignment outfit (model WJ-125) has been introduced by Weaver Manufacturing Div., Dura Corp., which enables even a one-man service shop to break into the profitable wheel alignment business. The complete outfit includes all the basic gauges necessary—two 3-way alignment gauges, one Tru-Way toe gauge, one pair of turning radius gauges and one portable wheel alignment tester—to form the core of a new department and to turn out quickly and accurately any alignment work brought in. As the department grows, other equipment can be added for greater convenience and increasing production.

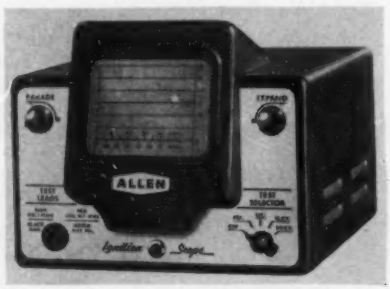
(Circle No. 34 on Reader Service Card)

"But officer . . . that says 'fine for parking'!"

These are new *manufacturers' products*

New Allen Scope

Just two controls, three external connections, dial test selector and unmatched stability are the outstanding features of the new 3/2 Scope recently announced by Allen Electric and Equipment Co. Foremost among the many new features is the color-coded hookup which calls for just three con-



nections, made at the distributor.

Controls are simplified by the use of an electronic locking device to insure pattern stability without adjustments of any kind. As a result, there are just two controls, one for "pattern parade" and another for "pattern expand." These controls, plus a test selector switch, provide superimposed primary and secondary readings plus secondary voltage checks at 15 KV and 30 KV levels.

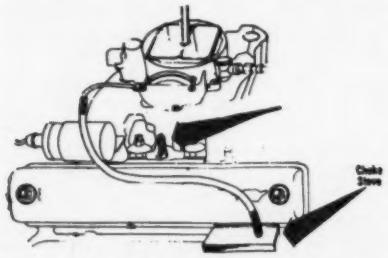
A push-button allows direct reading of cam angle in degrees while cranking the engine with distributor cap removed. A spark plug condition reading is also provided.

This light weight, 23 lb. unit can also be used as a handy road-test scope with the simple addition of a standard commercial 50-watt inverter.

(Circle No. 35 on Reader Service Card)

Self-Filtering Choke Stove

Better Part Specialties announces that its choke stove is now self-filtering to automatically clean air . . . no filter clog. It supplies a greater vol-



ume of heat to operate automatic chokes under all weather or driving conditions. Eliminates sticking choke, wasted gas, plugged air passages and complete carburetor failure.

The BPS Choke Stove is easier to install . . . no taping or drilling is necessary. Custom Fit Model and Universal Model for all cars is available.

(Circle No. 36 on Reader Service Card)

Spark Plug Air Pump

The Imperial Spark Plug Tire Pump Co. announces a new spark plug air pump for use on tractors, trucks, and cars, as well as all pneumatic sports equipment. The pump comes com-

pletely equipped with four different spark plug thread sizes so that there is nothing else to buy . . . no sizes to worry about . . . it will take care of all user's needs and will pump up to 130 lbs. of clean fresh air without harm to the engine.

The unit comes complete with built-in 100 lb. pressure gauge, 16 ft. of heavy-duty corrugated rubber tubing and adapters to fit 18 mm., 14 mm., 10 mm., and ⅞" spark plug openings.

(Circle No. 37 on Reader Service Card)

Battery Cables

New Corrosion Guard battery cables from Whitaker Cable Corp. contain an exclusive Duravin insulating sleeve,

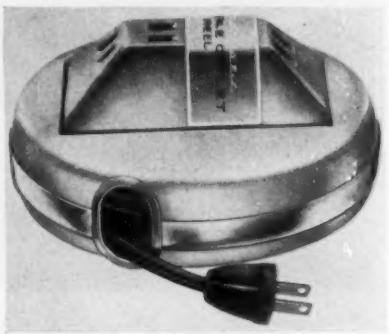
which is said to protect the weld between terminal and cable. The sleeve is fused to the Duravin insulation covering the cable itself.

Whitaker also uses an exclusive arc-welding process to join cable and terminal, instead of soldering or crimping the terminal to the cable. This "flash-welding" process is said to securely join each strand of the cable to the terminal, giving greater resistance to intergranular corrosion for longer cable life.

(Circle No. 38 on Reader Service Card)

Portable Outlet Reel

Cordomatic's Portable Outlet Reel provides 3-way outlets wherever needed to bring light and power to your

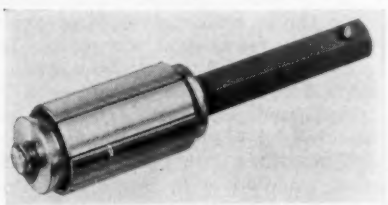


work. Just plug in cord and carry reel wherever you want to use it. Cord pulls out to any desired length up to 15 ft. . . . locks . . . automatically retracts into housing when not in use. Automatically retracting reel promotes safety and protects wiring, insuring long wear.

(Circle No. 39 on Reader Service Card)

Pipe Expanding Tool

A tool designed to take clamp grooves and dents out of muffler bushings and pipes in a matter of seconds has been announced by the



Walker Manufacturing Co. The tool, called Spee-D-Expander, is said to provide a perfectly formed, burr-free pipe for safe, gas-tight exhaust system connections.

Adjustable to fit pipes from 1⅝" to 2⅛" I.D., the expander can expand a pipe up to a length of 6"½ merely by repeated positioning.

(Circle No. 40 on Reader Service Card)

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Battery-Generator Indicator

A double-duty engine instrument, for universal use on any boat, vehicle, stationary engine or wherever a 12-volt storage battery is employed, with or without a generator, has been announced by the Instrument Division of Stewart-Warner Corp.

The new Model 375-E Battery-Generator Indicator is both a battery con-

dition indicator and a voltmeter, combined in a single dial and case. It tells at a glance the amount of charge in the battery; in installations in which a generator is operated by the engine, it becomes a voltmeter as soon as engine is started.

In a typical operation, on an engine having a generator, the indicator will register between 12 and 13 when the engine is not running and the battery is in properly charged condition. When engine is started and the generator is functioning properly, the reading will normally be in the 14-15 range. However, if generator is overcharging—possibly due to malfunction of the voltage regulator—the reading will be something above 15, giving warning that an immediate check-up is required.

(Circle No. 41 on Reader Service Card)

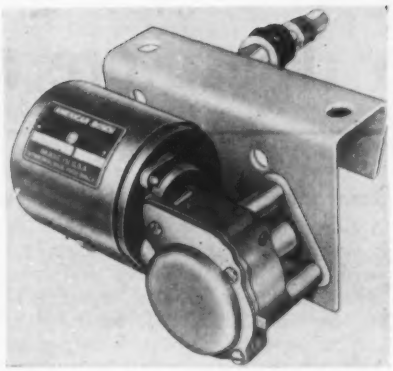
Heavy-Duty Electric Wiper

A new heavy-duty electric windshield wiper, called the "Twenty-Twenty" because of its capacity to operate an arm up to 20" long carrying a 20" blade, is announced by American Bosch Arma Corp.

The unit consists of a new heavy-duty version of the WWC electric windshield wiper motor, a mounting bracket and an oscillating shaft with connecting drive linkage all consolidated into one unitized assembly. This makes installation easy and provides for a wide range of application possibilities.

Due to the availability of two crank arms with different lengths of throw, and four lengths of pivot shafts each provided with three crank pin holes, the Twenty-Twenty can be assembled to provide 5 different wiping angles (68 to 127 deg.) and 4 pivot shaft lengths (⅝", 1", 2" and 3").

The wiper is supplied completely assembled for specific wiping angles and pivot shaft lengths. However, to permit a minimum inventory yet provide for miscellaneous replacement installations where various wiping angles and pivot shaft length requirements are encountered, it is also available in kits consisting of the motor (6, 12 or 24 volt), the bracket and mounting screws. These kits, when assembled to the proper motor crank arms and pivot shafts, can be made up for any of the various combinations of voltage, wiping angle and shaft length.



(Circle No. 42 on Reader Service Card)

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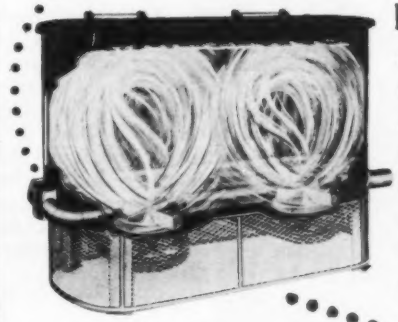
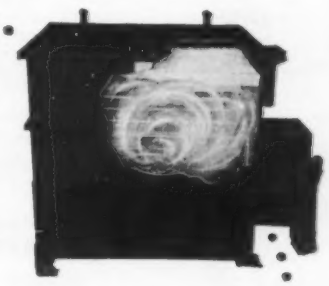


Model 236 is equipped with two 5-HP motors turning impellers, creating tremendous agitation of the detergent. A scrubbing action is thus attained to clean FASTER, MORE THOROUGHLY, and MORE ECONOMICALLY! With 300 gallon capacity this unit answers the Engine Rebuilder's Cleaning Problem!

Model 122 has a 115 gallon capacity. The ideal size for the average Automotive Machine Shop. Powered with one 3-HP motor. ALL TURBO-BLAST CLEANING MACHINES HAVE SUPER AGITATION! ...with CONTROLLED FLOW PATTERN! All models can be equipped for gas, oil, steam, or electricity.



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These are new *manufacturers' products*

Emergency Snap Ring Kit

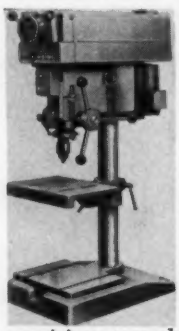
An emergency package of 52 of the most-called-for snap rings for replacements in the automotive and small motor maintenance and repair fields is now offered by K-D tools.

The new package, in a two-and-a-half by three-and-a-half-inch handy plastic box, makes it possible for a mechanic to replace a broken, worn, or lost snap ring immediately. An extra special feature of the new package is that it contains a chart with exact-size silhouettes of each of the 52 rings with its K-D catalogue and size number from which the mechanic can re-order replacements in quantity replacement packages.

(Circle No. 43 on Reader Service Card)

Bench and Floor Drills

The 15 in. bench and floor drills offered by the Clausing Div., Atlas Press Co. are available with choice of positive power variable speed drive that makes instantly available any speed from 500-4500 rpm while drill is running, or 5-speed drive with spindle speeds from 410-5380 rpm.



Other features include: 10″ x 14″ precision ground tilting table; massive base with 10″ x 13″ ground working surface; positive depth stop; front mounted safety switch; splined drive spindle supported by two lubricated-for-life ball bearings; precision-ground spindle floated free from quill by two over-sized lubricated-for-life ball bearings; machined and balanced pulleys; choice of ½ or ¾ hp. motor.

(Circle No. 44 on Reader Service Card)

Fuel Pumps, Kits and Parts

A line of repair kits and replacement parts for rebuilding Carter fuel pumps is announced by the Kem Manufacturing Co., Inc., as well as a program of rebuilding Carter fuel pumps now appearing as original equipment on some cars and trucks.

Kem parts, kits and pumps are now offered to the wholesale, service and rebuilding trades as the only independently manufactured replacements for the Carter fuel pump line.

(Circle No. 45 on Reader Service Card)

Parts Storage Cabinet

A new dealer cabinet which features in-the-door parts storage, has been announced by Standard Motor Products, Inc., for use with its "Blue Streak" and "Standard" ignition lines. The new cabinet, called the "Spacemaster", has simulated mahogany paneling designed to give it a "furniture" look.

BLUE STREAK'S "SPACEMASTER" CABINET

In order to increase the cabinet's capacity without increasing its size, Standard built storage compartments right into the doors. These alone can hold over 300 small parts, all completely visible. The cabinet takes up less than three square feet of floor space and is under five feet high.

(Circle No. 46 on Reader Service Card)

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Generator Output . . . *(Continued from page 24)*

idle speed, then bringing it up to 1,500 rpm. This applies to the single contact voltage regulator. When the double contact regulator is used, the adjusting procedure is the same but the engine speed should be brought to 2,200 rpm. This will give the reading with the "shorting" contacts working. Drop the engine speed to 1,500, which should put the "series" contacts in the circuit. The reading should drop off slightly, then remain steady.

CURRENT COIL

If a coil with a few turns of heavy wire is wound on a soft iron core it will form an electro-magnet when current flows through the coil. The voltage drop through a coil of this kind is small as to be negligible, but the magnetic effect will be proportional to the number of ampere turns, when connected in series in the generator circuit, so that full generator output passes through the coil. The strength of the magnet will be proportional to the number of ampere-turns, the same as with the voltage coil. Thus, with 30 amps. flowing through six turns of heavy wire, there will be 180 ampere-turns. This type of coil is called a "current coil" (Fig. 2), since its magnetic effect is proportional to the number of amperes flowing through it. Such a coil is valuable for use in a current limiter (or regulator) in the same way that the voltage coil is useful for controlling generator voltage. It is connected so that the output current of the generator flows through it at all times and the magnetic effect is utilized to limit the maximum amount of current the generator is permitted to put out.

While the voltage limiter is in action most of the time to maintain the generator voltage within fairly narrow limits, the current limiter allows the current to vary from a few amperes to the safe maximum output. This depends on connected load and battery condition. There is no need to maintain the current at a uniform strength, but only to keep it from getting so powerful that it will cause damage to the generator armature or the conductors in the various circuits which receive generator current. Therefore, the current limiter only goes into action when the electrical load conditions and generator speed are such that there could be excessive current produced.

CURRENT LIMITER

The current limiter is much like the voltage limiter except for the coil. There is the same kind of hinged lever or armature and pair of contact points through which the field current flows. The contact points of the voltage limiter and the current limiter are in series (Fig. 5) so that opening of either set will break the direct field current path and force the cur-

(Continued on following page)

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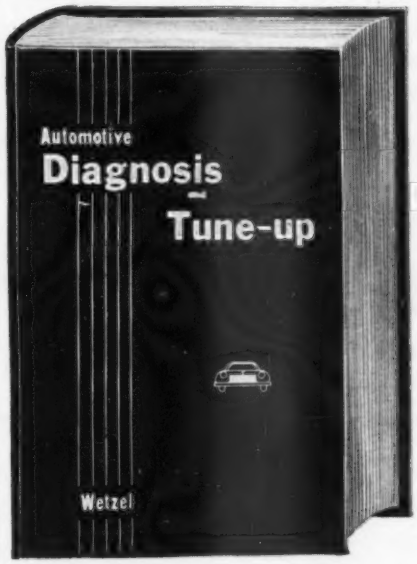

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Generator Output . . . CONTINUED

rent to flow through a resistor. Thus, either high voltage or excessive current will reduce the field current and result in reducing the generator voltage or current to predetermined values which will be safe and satisfactory. Fig. 5 shows this. In this illustration the so-called B circuit is shown in which the field current goes to the generator **from** the regulator and is grounded in the generator. In the A circuit, the field current is supplied from the insulated brush and is grounded at the regulator.

ADJUSTING THE CURRENT LIMITER

The generator may be controlled by **either** the voltage limiter or the current limiter, never by both at the same time. Normally the voltage limiter is in control. Therefore, in order for the current limiter to be checked to see whether it needs adjustment it is necessary to temporarily eliminate the control of the voltage limiter. This may be done in several ways. One way is to have the cranking motor turn the engine for 30 secs. which will remove the surface charge from the battery plates so the battery will accept enough current for a short time to lower the generator voltage below the controlled value. Another way is to short out the voltage limiter points with a jumper, with cover removed. A third way is to place a load across the battery by means of a carbon pile rheostat to keep the voltage down.

Run the engine at 1,500 rpm so that a current in excess of the current limiter setting would be put out by the generator if there were no current limiter. Connect an ammeter between the G or A terminal on the regulator and the conductor that was removed from this terminal, putting the instrument in series with the generator output circuit.

The ammeter reading will be the setting of the current limiter. If it needs adjusting, bend the spring hanger UP to increase the maximum current output, or DOWN to decrease the maximum current. The check of the current setting may be made with the cover off and without putting it back as the small difference this would make in the setting is unimportant, not true of the voltage setting.

CUT-OUT RELAY

The third member of the regulator team is the cut-out relay (Fig. 10). The purpose of this unit is to act as a one way check valve to keep battery current from flowing to ground through the generator circuit and thereby, running down the battery. It works somewhat like the voltage and current limiters except that it has both a voltage and a current coil and the armature is pulled down to **make** a contact instead of breaking the contact between two contact points.

The voltage coil is in parallel with the generator, with one end connected to the generator circuit and the other end grounded. The current coil, wound on the same core is in series with the generator so that the full amount of current produced by the generator flows through the current coil.

When the engine starts and the generator is driven it will at once start to build up voltage or electrical pressure and a small amount of current will flow through the voltage coil to ground. As the generator speed increases the voltage impressed on the voltage coil will increase. When it gets up to a predetermined value the magnetism built up by the voltage coil becomes strong enough to attract the cut-out relay armature and cause the contact points to close.

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As soon as this happens, the generator output starts to flow through the current coil in such a direction that its magnetism is added to the magnetism of the voltage coil, helping to keep the contact points closed. The closing of the contact points completes the circuit to the battery and the car's electrical system and the generator then supplies all the current used by the electrical equipment on the car.

At any time that the engine and generator slows down and the generator voltage falls slightly below battery voltage, there is a surge of current from the battery in the reverse direction. This reverses the polarity of the magnetism of the current coil so that it opposes and neutralizes the magnetism of the voltage coil. It allows the spring to open the contact points and break the generator circuit. Thus no current can flow back from the battery through the generator. The cut-out relay only affects the circuit between the battery and the generator so that the battery is free to supply current to the lights, ignition, radio and other units.

ADJUSTING CUT-OUT RELAY

The C.O.R. must be set to close at the specified voltage which is generally around 6.4 volts for 6-volt systems and 12.8 volts for 12-volt systems. If the setting is not as specified it should be corrected. To increase the closing voltage it is necessary to increase the spring tension. To lower the closing voltage, the tension is decreased. The voltage is checked with a voltmeter, after the generator and regulator have been operating long enough to get up to normal operating temperature. The voltmeter is connected to the A or G terminal on the regulator and to ground.

The air gap and point opening should also be checked, and if not according to specifications must be corrected. The battery lead to the regulator should be disconnected when making this check. For the air gap, place fingers on the armature above the core and move the armature down until the points just close. Measure the gap between the armature and center of core with a feeler gauge. Adjust the gap by loosening two screws in back of the relay and raise or lower the armature as may be required. After setting, tighten the screws. The point opening when wide open is checked and corrected if necessary by bending the upper armature stop.

CLEANING REGULATOR CONTACT POINTS

The place where most generator regulators fail is at the contact points on the voltage limiter and the current limiter. After a year or more of constantly vibrating to open and close the circuit, the contact points may become oxidized, corroded or worn. If this is the case, they may not make good contact and there will not be enough field current flowing to allow the generator to put out its normal current. This will be indicated by the ammeter (if

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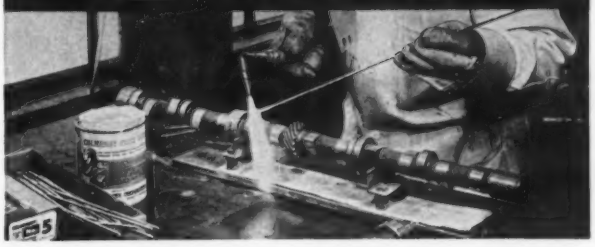

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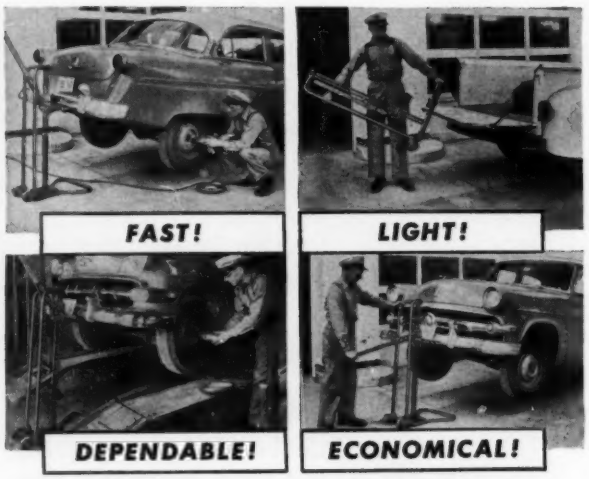

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Service-Master

3-TON BUMPER JACK BY VULCAN

VULCAN MFG. CO., INC. WINONA MINNESOTA

Generator Output . . . CONTINUED

there is one on the car's panel) or by the generator signal on the dash.

If current generation stops because of dirty contact points, the points can be easily cleaned, which in most instances will restore the regulator to good operating condition.

With either a flexstone or a small piece of 300 to 400 grit wet-or-dry abrasive paper, open the points by hand just enough to insert the abrasive between them. Move the abrasive lengthwise (not crosswise) of the armature eight to ten times for each point to clean off any scale, oxide or other foreign matter. Then take a piece of 3x5 hard finished index card and work it between the points to remove any grit that may have been left on the points. Next polish the points with crocus cloth, which is a fine abrasive. Finally use a strip of the same 3x5 card wet with carbon tetrachloride and rub lightly between the points to clean them. A piece of lintless cloth is better, if available. These contact points are sensitive and it takes very little to keep them from making good contact.

Many regulators which may be considered to have failed and become unusable can be restored to satisfactory service by carefully cleaning the contact points. The cut-out relay points seldom need attention as they only make and break contact with changes in the generator voltage and do not vibrate.

WORK TOGETHER AS A TEAM

Always remember that the generator, battery, and regulator work together as a team. The generator will put out either maximum controlled voltage and low amperage, or up to the maximum amperage, depending on the connected load and battery state of charge, at lower voltage. The lower voltage will be between maximum controlled voltage and slightly above battery voltage, with a range of from around 15 volts down to 12.4 volts, or 7.5 volts to 6.2 volts, for 12- and 6-volt systems, respectively.

There will never be high voltage and high current strength at the same time unless something is radically wrong. When there is a heavy demand for current to help charge a low battery and with all appliances, lights, etc., turned on, the voltage will automatically drop. When the battery is well charged and there is no load, except the ignition system and possibly the radio, the voltage will be at the maximum controlled value, when the engine is running at a speed of 25 mph or more.

WHEN CHANGING YOUR ADDRESS

Please notify us 5 weeks in advance. Supply us with both your old and new address, including address label from current issue if possible. Copies we mail to your old address will not be delivered by the Post Office unless you pay them extra postage. **Mail address changes to Circulation Dept. Automotive Service Digest, 900 South Wabash Ave., Chicago 5, Ill.**

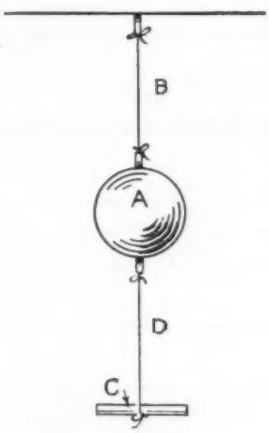
BRUSHING UP ON THOSE

EASY-TO-FORGET THINGS

Refresher course

✔ *Phenomena due to inertia*

• INERTIA IS THE PROPERTY of matter by which it remains at rest or in uniform motion in the same straight line or direction unless acted upon by some external force. Inertia is the most characteristic property exhibited by matter. If any moving body be stopped its arrest always is due to some influence outside of itself. Similarly, if a body at rest be set in motion, such motion must be imparted to it by some other body.



Countless familiar phenomena are due to inertia—the onward motion of standing passengers in a moving bus when the driver suddenly applies the brakes; water flying from a revolving grindstone; breaking of an axle shaft when accelerating too rapidly from a standing start; violent jar of a water pipe on suddenly closing a faucet, and so on.

For example, assume a weight (A), suspended by a string (B), and a small bar (C) attached to weight (A) by another string (D). If there is a steady downward pull on (C), string (B) will break. The tension in string (B) is greater than in the lower string (D), because it has to support the weight (A) and resist the pull at (C).

If a sudden pull is applied to (C), string (D) will break. Due to the inertia of the weight (A), the string (D) breaks before the pull reaches the upper string (B).

Here is valuable information on every type of truck manufactured

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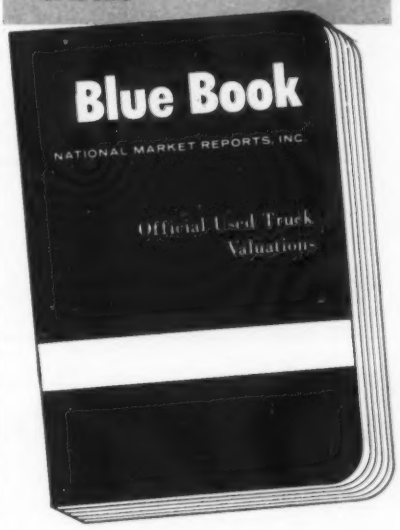
RETAIL PRICES
INSURANCE
TAXES



TRUCKING is today one of America's biggest and fastest growing industries. Eliminate guess work. . . . Avoid money losses. . . . Gain more business. . . . Gain greater customer satisfaction by giving the proper, true valuation of Every Used American Truck for at least the past 7 years for your area. Published semi-annually. Annual subscription including both bound, pocket-size volumes only $10.00 postpaid.

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900 S. Wabash Ave., Chicago 5, Illinois

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City ..... *Zone* .... *State* .....

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Send all orders to: Classified Advertising Manager,
c/o AUTOMOTIVE SERVICE DIGEST, 900 South Wabash Ave., Chicago 5, Illinois

Classified Rate: 50c a Word; Minimum Charge $10.00

AUTOMOTIVE SERVICE DIGEST
900 South Wabash Ave., Chicago 5, Illinois _____ 19____

Please insert the following _____ word Classified advertisements in the_____

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YOUR NAME_____

FIRM NAME_____

STREET ADDRESS_____

CITY, ZONE & STATE_____

Please Note!
Advertisers using an abbreviated firm name or post office box address, must furnish a *complete* firm name street address and the name of owner, president or general manager, for our office records.

Write or Paste Your Best Pulling Advertisement Here

1	2	3	4
5	6	7	8
9	10	11	12
13	14	15	16
17	18	19	20—$10.00
21—$10.50	22—$11.00	23—$11.50	24—$12.00
25—$12.50	26—$13.00	27—$13.50	28—$14.00
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33—$16.50	34—$17.00	35—$17.50	36—$18.00
37—$18.50	38—$19.00	39—$19.50	40—$20.00
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AGENTS WANTED

GOLD OR SILVER Letters, Numbers. Trucks, Windows, Doors. 1" to 6". 500% Profit. Free Samples. Atlas, Box 543-M, Oak Lawn, Ill.

Automotive Publisher seeks aggressive Agents who now call on Automotive Jobbers.
Easy way to earn extra money.
No subscription selling required.
For further information contact
Automotive Service Digest
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900 So. Wabash Ave., Chicago 5, Illinois

FARM EQUIPMENT VALUATION GUIDE sells in volume to Farm Implement Dealers. Big Profits. Write — Farm Guide, NMR, 900 South Wabash, Chicago 5.

AUTOMOTIVE BODY TOOLS

NEW AND RESHARPENED Auto Body Files. File resharpening, quick service, quality workmanship, competitive prices. A. O. Barnes Company, Anderson, Indiana.

AUTOMOTIVE SUPPLIES

FREE! WORLD'S LARGEST automotive wholesale catalog. 404 Pages. Over 100,000 items for cars, trucks, 1920-1961, foreign, sports, rods, customs. Rush name, address, business card, letterhead. Warshawsky, AD-1, 1900 S. State, Chicago 16.

BUSINESS OPPORTUNITIES

SPARE TIME CASH—If you have a little land, learn to live in country without farming, many projects, easy to start, fascinating and enjoyable. Publication 25c leads the way. Country Living, Inc., 337-A Pittock Block, Portland 5, Oregon.

AUTOMOBILE BUMPER FRANCHISE: One of nation's largest reconditioned bumper processors now making available exclusive franchises in cities or trading areas 50,000-150,000 population. Responsible salesminded party can earn $10,000 yearly. Individual or company can be in established business now. Must have station wagon or pickup truck and $1,500 to $3,000 invest returnable merchandise. Write Sales Manager, Banda, Inc., 2558 Elston, Chicago, Illinois.

BIG MONEY—Operate own fix-it shop. Service household appliances, motors, mowers, saws, skates, etc. Free book. Christy Trades School, A-190, 3214 W. Lawrence, Chicago 25.

FOR SALE

VAN NORMAN Crankshaft Grinder Model III for large shafts. Also Landis Crankshaft Grinder 18 inches by 64 inches between centers, both in excellent condition, bargain. Adams, 1128 Iris Street, San Luis Obispo, Calif.

INVENTIONS WANTED

INVENTIONS Wanted for immediate promotion! Patented; unpatented. Outright Cash or Royalties. Free Protection Form; write Casco, Mills Building, Washington 6, D.C.

SALESMEN WANTED

AD BOOK MATCHES
Sell Full or Part Time.

Cash daily commissions bring you tops in steady earnings: Premium Plan for you, customers, lands big orders. Show Glamour Girls, Sensational Tenorama, Hillbillies, Big Holiday Line now ready. All wanted sizes.

FREE Master Outfit tells you where to go, who to see, what to say, for quick sales. Fast Action if you give age, experience.

SUPERIOR MATCH
Dept. BA 1260, 7530 S. Greenwood, Chicago 19

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Calendar of Automotive Events

1961

Feb. 14-15—Automotive Service Industry Assn. Convention, Biltmore Theatre, Los Angeles, Calif.

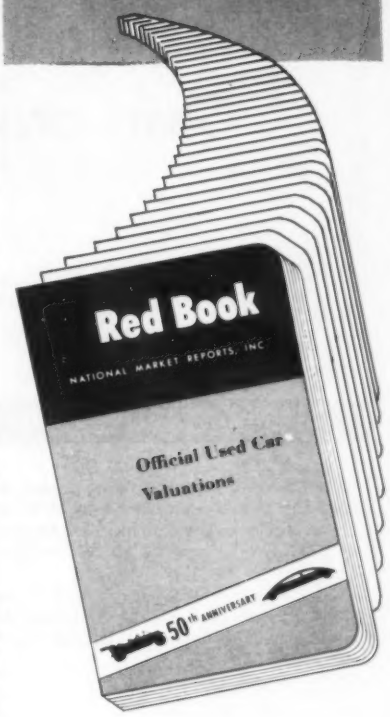
Feb. 16-19—1961 International Automotive Service Industries Show, Los Angeles Memorial Sports Arena, Los Angeles, Calif.

Feb. 23-26—Association of Diesel Specialists, Annual Meeting, Granada Hotel & Inn, San Antonio, Texas

May 14-17—Automotive Engine Rebuilders Assn., 39th Annual Convention, Hotel Fontainebleau, Miami Beach, Fla.

June 28-July 1—IGO National Convention, Lowry Hotel, St. Paul, Minn.

50 YEARS OF DEPENDABLE SERVICE



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Official Used Car Valuations

Always have the latest IMPARTIAL, TRUE (Retail, Finance and Wholesale) VALUES of all makes, models. **DOMESTIC** and leading American **IMPORT** cars for past 9 years PLUS Trucks (up to 1½ ton) for past 7 years.

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NATIONAL MARKET REPORTS, Inc.

900 South Wabash Avenue
Chicago 5, Illinois

HE WHO LAUGHS, COME WHAT MAY,

WILL LIVE TO LAUGH ANOTHER DAY

Short circuit smiles

The Jobber's wife was being teased by a neighbor who'd seen her husband in the company of a fancy-looking blonde dish. The wife calmly squelched her annoyer by saying:

"All I know is that Joe brings home his pay check each week. Anything he can get for nothing at the age of fifty—he's entitled to!"

★ ★ ★

A salesman who had been traveling on the Long Island Railroad for a number of years was complaining about the trains always being late, when to his surprise, the train pulled in on time. The salesman went over to the conductor and said: "Here's a medal for you. I've been traveling this road for 15 years and this is the first train I ever saw on time."

"Keep your medal, sir," answered the conductor, "this is yesterday's train."

★ ★ ★

If a man runs after money, he's money mad.
If he keeps it, he's a capitalist.
If he spends it, he's a playboy.
If he doesn't get it, he's a ne'er-do-well.
If he doesn't try to get it, he lacks ambition.
If he gets it without working he's a parasite.
If he gets it after a life of hard labor, he's a fool who got nothing from life!

★ ★ ★

Two houseflies were conversing and the first said, "Sylvester, aren't people funny?" "Yes, George," said Sylvester, "but what made you think about it just now?" "Well," replied George, "I was just thinking how much money they spent building a beautiful ceiling like this—and then they walk on the floor."

★ ★ ★

Foreman: "You're asking big pay for a man with no experience."

Applicant: "Well, the work is harder when you don't know anything about it."

The newly rich woman was going through a "culture" routine and at this particular moment was standing in front of a painting at New York's famous Metropolitan Museum. It was a beautiful oil of a ragged but happy vagabond.

"Well!" exclaimed the woman indignantly. "How do you like that? Too broke to buy a decent suit of clothes, but he can afford to go out and get his portrait painted."

★ ★ ★

Cute Nurse: "Doctor, I'm afraid that truck driver in Room 208 isn't doing too well."

Doctor: "Well, let's make him as comfortable as possible. Give him what he wants."

Nurse (blushing): "Not on your life, Doc. Not until he proposes."

"It was a wreck of a sort . . . my wife threw it at me!"

It was a sweltering summer day, and the perspiring obstetrician was rushing frantically to examine all his patients before answering a summons from the hospital.

"These hot August days getting you down doctor?" asked one woman sympathetically.

"No," said the doctor, "it's not these hot August days that are bothering me—it's those cold nights last November."

★ ★ ★

Vacationer: "Are you sure there are no crocodiles in these waters?"

Native: "Absolutely. The sharks scare them away."

★ ★ ★

The hotel clerk was losing his patience. "Look," he said, "I've told you a dozen times, we don't have any rooms. We're full!"

"If President Eisenhower came in," the man persisted, "you'd have a room for him, wouldn't you?"

"Why, of course," the clerk admitted.

"Then let me have his room. He's not coming."

★ ★ ★

A colt trotted up to the bookmaker at the race track and neighed, "I want to bet $2 on myself to win in the third."

"What!" screamed the gambler.

"Surprised to learn I can talk?" asked the horse.

"No," said the bookmaker, "I just don't think you can win!"

★ ★ ★

The lawyer was reading the will of a wealthy executive, recently deceased:

"And to my nephew whom I promised to remember—'Hi, there, Charlie'!"

★ ★ ★

How'd you get along with your wife in that fight the other night?"

"Aw, she came crawling to me on her hands and knees."

"Yes, what did she say?"

"Come out from under that bed, you coward."

★ ★ ★

A high school girl, seated next to a famous astronomer at a dinner party, struck up a conversation with him by asking, "What do you do in life?"

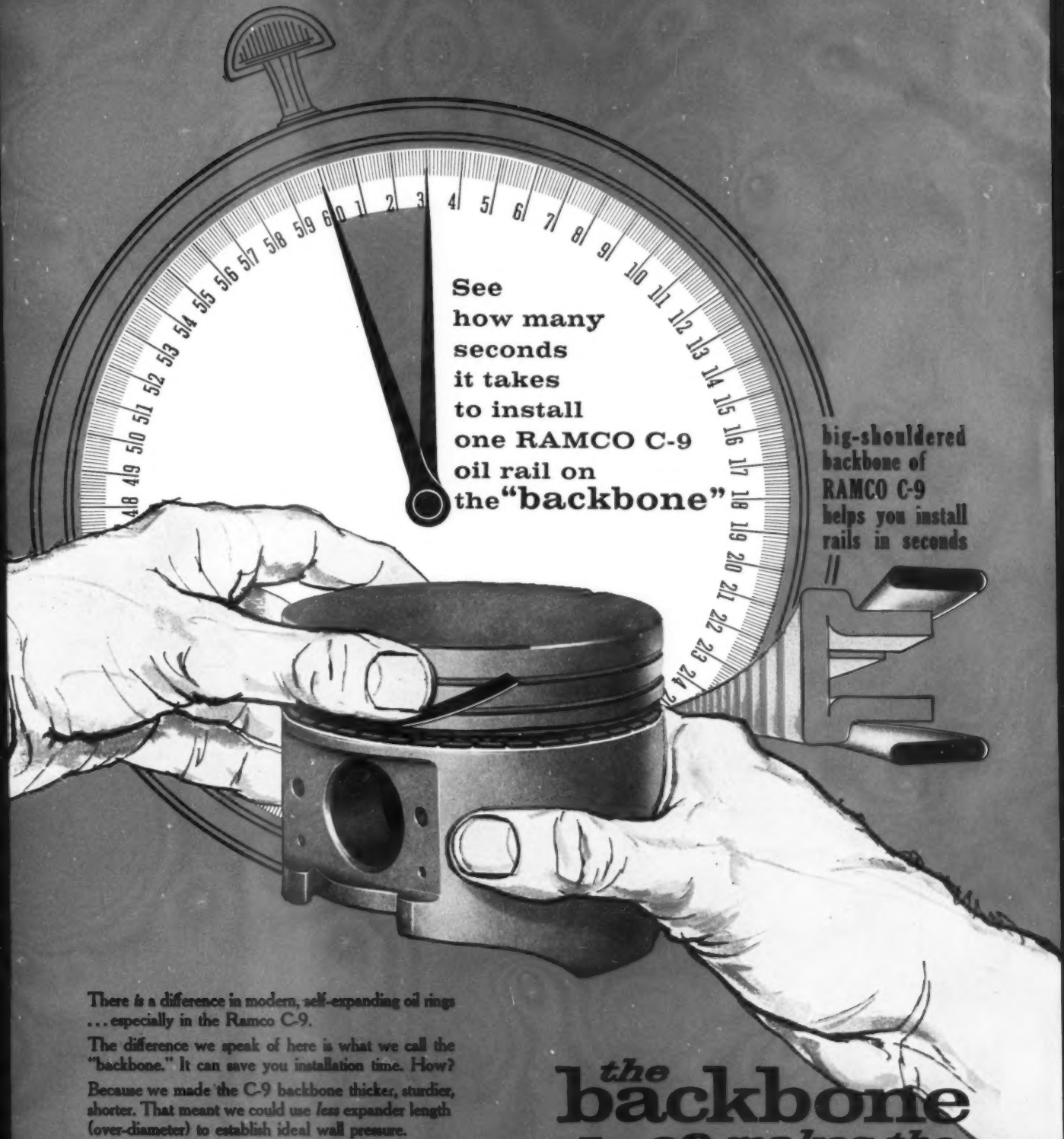
He replied, "I study astronomy."

"Dear me," said the girl. "I finished astronomy last year."

★ ★ ★

The teen-age daughter was troubled by violent spells of coughing. Her mother took her to see a doctor. The doctor explained that the girl's chest must be exposed for his examination. He then placed his stethoscope on her chest, and smilingly said, "Big breaths."

"Yeth," responded the girl proudly, "and I'm only thixteen."



There *is* a difference in modern, self-expanding oil rings . . . especially in the Ramco C-9.

The difference we speak of here is what we call the "backbone." It can save you installation time. How?

Because we made the C-9 backbone thicker, sturdier, shorter. That meant we could use *less* expander length (over-diameter) to establish ideal wall pressure.

So: rails "click" into position easier against the backbone's big shoulders, because they have less expander to "go around." There's less chance for them to slip off, less chance of "overlap." That saves you time.

Next time you install a Ramco C-9, look for this difference. Feel the strength, note the shorter length. Note how fast it installed. And when you're done, watch the performance. It works.

See us at Booths No. 1303-4-5-6 at the I.A.S.I. Show

the backbone *makes the* difference

Fast installation is only one of the many differences the Ramco backbone brings you. They are all described in our folder: "BACKBONE FACTS." See your Ramco Jobber, or write for your free copy:
RAMSEY CORPORATION, ST. LOUIS 8, MISSOURI
a subsidiary of Thompson Ramo Wooldridge Inc.

RAMCO MODERN POWER PISTON RINGS

C-202-18 Copyright 1961 Ramsey Corporation

new

optical precision mirror smooth

POLISHED TUNGSTEN CONTACTS

BOTH CONTACTS have EXTENDED RADII for maximum surface contact

another advance in
"the Crown Jewels of Ignition"

brings you a new, never-before possible freedom from **blemishes**
pitting
misalignment

it all adds up to . . . PROFIT for dealers and extra value for your customers

Filko
Crown Jewels of Ignition

F. & B. Mfg. Co.
4248 W. Chicago Ave.
Chicago 51, Illinois

GRINDING and POLISHING for eyeglasses, microscopes and telescopes are examples of precison tolerances and perfection such as are now embodied in the new mirror smooth contacts in Filko Contact Sets for cars, trucks, tractors, marine, fractional h.p. engines.

G-1168

See us at the I.A.S.I. Show
Booths No. 1223-24